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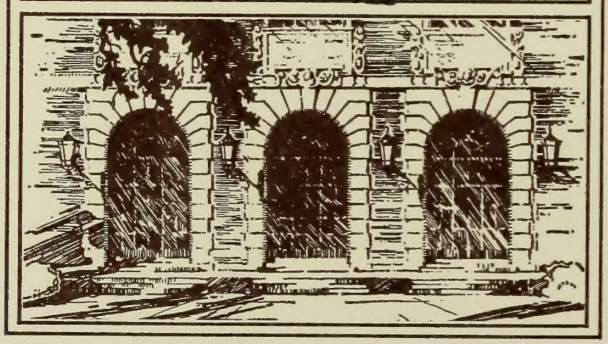

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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 4, NUMBER 13
JULY 1, 1971

W71-06456 -- W71-07058

SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information will now be provided by NTIS.

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 4, NUMBER 13
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W71-06456 -- W71-07058

Use of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
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SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

THE PROBLEM OF FORMATIONS OF THE ION COMPOSITION AND MINERALIZATION OF FRESH WATER ICE UNDER VARIOUS CONDITIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W71-06786

THE GENERATION OF ELECTROMOTIVE FORCES DURING THE FREEZING OF WATER,
Columbia Univ., New York. Stanley Thompson Labs.
For primary bibliographic entry see Field 02C.
W71-06925

METHODS FOR COLLECTION AND ANALYSIS OF WATER SAMPLES FOR DISSOLVED MINERALS AND GASES,
Geological Survey, Washington, D.C.
Eugene Brown, M. W. Skougstad, and M. J. Fishman.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC -- $2.00. Geological Survey Techniques of Water-Resources Investigations, Book 5, Chapter A1, 1970. 160 p, 14 fig, 3 tab.

Descriptors: *Water chemistry, *Water analysis, *Surface waters, *Groundwater, *Sampling, Methodology, Chemical analysis, Test procedures, Physical properties, Biological properties, Gases, Laboratory tests, On-site tests, Instrumentation, Dissolved solids.
Identifiers: *Water samples.

Methods used by the U.S. Geological Survey to collect, preserve, and analyze water samples for their content of dissolved minerals and gases are described. Among the topics discussed are selection of sampling sites, frequency of sampling, sampling equipment, sample preservation, laboratory equipment and instrumental techniques, accuracy and precision of analysis, and reporting of results. Seventy-six analytical procedures are given for determining 55 water properties. (Woodard-USGS)
W71-07032

02. WATER CYCLE

2A. General

ALASKA-TEN YEAR COMPREHENSIVE PLAN FOR CLIMATOLOGIC AND HYDROLOGIC DATA.
For primary bibliographic entry see Field 06B.
W71-06521

THE REPRESENTATION OF STORM PRECIPITATION FIELDS NEAR GROUND LEVEL,
California Univ., Davis.
For primary bibliographic entry see Field 02B.
W71-06658

HEAT AND WATER REGIME OF SOME SIBERIAN REGIONS (Russian: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiri).
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).

Leningrad, 'Nauka', 1970. 113 p.

Descriptors: *Hydrologic aspects, *Heat balance, *Water balance, *Permafrost, Streamflow forecasting, Soil water, Ice-Water interfaces, Snow surveys, Climatic data, Cold regions, Hydrologic data, Heat budget, Meteorological data, Soils, Hydrogeology, Geomorphology, Land reclamation.
Identifiers: *Siberian regions, Hydrologic areas, Amur Oblast, Transbaykal, Irkutsk Oblast, Yakutsk ASSR, Seasonal fluctuations.

This is a seven-paper collection concerned with the climatic and hydrologic conditions of various regions of Siberia, for the purpose of calculating water and heat balances and dividing the area into regions according to character of runoff, moisture and heat supply. A brief assessment is made of rural hydrologic resources and of the results of studying hydrologic properties of snow cover on taiga landscapes. Of particular interest is the breakdown of vast areas of Siberia into regions according to streamflow, moisture content (soils, snow, groundwater), and heat supply. Subjects covered include a hydrologic description of the Transbaykal and the West Siberian Plain, calculation of heat and water balances in the Irkutsk Oblast, discussion of moisture types in the Amur Oblast, and properties of snow crystals in the central taiga of Western Siberia, study of orographic temperature inversion of air in Eastern Siberia, and ice formation in the southern Yakutsk ASSR. (See also W71-06708 thru W71-06713) (Josefson-USGS)
W71-06707

ELEMENTAL AND HYDROLOGIC BUDGETS OF THE PANAMANIAN TROPICAL MOIST FOREST,
Georgia Univ., Athens. Inst. of Ecology.
J. T. McGinnis, and F. B. Golley.
In: Symposium on Sea-Level Canal Bioenvironmental Studies, Proceedings of the 19th Annual Meeting of American Institute of Biological Sciences, September 4-5, 1968, Ohio State University, Columbus. Battelle Memorial Institute, Columbus Laboratories, Paper 14, April 21, 1969. 10 p, 2 fig, 2 tab, 22 ref.

Descriptors: *Rain forests, *Hydrologic cycle, *Ecology, *Food chains, Distribution patterns, Ions, Stable isotopes, Environmental effects, Productivity, Forests.
Identifiers: *Panama.

The tropical moist forest is characterized by a 3-month dry period and occurs extensively in the east-central area of the Republic of Panama and portions of northwestern Colombia. It is the primary region of the interior inhabited by man. Eight one-eighth hectare plots were harvested and analyzed for 13 elements. Movement and storage characteristics and potential inputs to man for nine elemental compartments and seven hydrologic compartments are presented. This report describes some aspects of the movement and storage of stable elements through hydrologic and elemental functions of the tropical moist forest ecosystem. (See also W71-06714) (Knapp-USGS)
W71-06717

WATER RESEARCH.

Allen V Kneese and Stephen C Smith, editors. Papers presented at Seminars in Water Resources Research, sponsored by Resources for the future and the Western Resources Conference, at Colorado State University, July 1965. The John Hopkins Press, Baltimore, Md, 1966. 526 p.

Descriptors: *Water resources, *Water resources development, *Planning, *Water Resources Research Act, Water management (Applied), Evaluation.

These conference papers reflect years of research activity on problems of planning and managing water resources. The following developments over the past decade are highlighted in the papers: (1) clarification and far-reaching applications of economic concepts to water development and use; (2) emphasis on cross-disciplinary research; (3) use of high-speed electronic computers in water management research; (4) emphasis on problems of recreation, water quality, and management of water-associated land used; (5) more research on political, administrative, and institutional factors; (6) the new role of federal agencies in water management research; and (7) the impact of the Water Resources Research Act of 1964. The papers are divided into areas including: (1) issues in theoretical economic analysis; (2) case studies of water management; (3) research on evaluation problems; (4) studies of water reallocation; (5) political and administrative studies; (6) research on hydrology and engineering; and (7) major research programs and needs. (See W71-06760 and W71-06761)
W71-06759

MAJOR RESEARCH PROBLEMS IN HYDROLOGY AND ENGINEERING,
William Ackermann.
In: Water Research, The Johns Hopkins Press, Baltimore, Maryland, p 495-501, 1966. 11 ref.

Descriptors: *Information retrieval, *Planning, *Water resources, Engineering geology, Dams.
Identifiers: *Water resources information, Urban hydrology.

Sources of information on water resources problems in general are discussed, such as government publications and publications of activities of professional organizations like the American Geophysical Union. Research problems on hydrology and engineering cited as needing special attention are: river forecasting for water resource mangement, urban hydrology, the engineering and geology of dams, evaporation and transpiration, and prime water resources. (See also W71-06759)
W71-06760

SOME OBSERVATIONS ON RAINFALL AND RUNOFF,
Norman H. Crawford.
In: Water Research The Johns Hopkins Press, Baltimore, Maryland, p 343-353, 1966. 10 fig.

Descriptors: *Runoff, *Runoff forecasting, *Rainfall-runoff relationships, Synthetic hydrology, Volumetric analysis.
Identifiers: *Volume-time distribution.

This paper's purpose is to explain the complex processes involved in finding the volume and time distributuon of runoff; two factors basic to the study of the rainfall-runoff relationship. Illustrations of the role of various basic hydrologic processes are made using digital synthesis models (Standford Watershed Model IV). A schematic description of a watershed, presented in the first section, provides background for concepts and terms which follow. The second section discusses volume of runoff, and the third illustrates timing and runoff distribution. The conclusion comments on education in the response of watersheds to rainfall and on the application of synthesis methods of investigation to water resources studies in general. (See also W71-06759)
W71-06761

THE YEARLY DISTRIBUTION OF RAINFALL INTENSITIES,
For primary bibliographic entry see Field 02B.
W71-06965

AVERAGE INTENSITY OF RAINFALL FOR USE IN THE RATIONAL FORMULA,
H. M. Gifft, and George E. Symons.
Water Wastes Eng, Vol 5, No 12, p 44-45, Dec 1968.

Descriptors: *Hydraulics, *Storm runoff, *Rational formula, *Rainfall intensity.
Identifiers: *Nomograms.

For convenience in design problems concerned with storm flow runoff where climatological data are not available, a monogram is provided and the map of iso intensities are applicable to the following formula, R—5.5 times H5 F (point 2)T (point 5) where: R—rainfall intensity (in./hr.), H5—rainfall intensity (in./hr., 5-year frequency), F—frequency of storms (years), and T—time of concentration (min.).
W71-06966

AVERAGE ANTECEDENT TEMPERATURES AS A FACTOR IN PREDICTING RUNOFF FROM STORM RAINFALL,
Charles D. Hopkins, Jr., and Dale O. Hackett.
J Geophys Res, Vol 66, No 10, p 3313-3318, Oct 1961.

Descriptors: *Rainfall-runoff relationships, *New York, *New England, *Basins, *Storms, Rainfall, Storm runoff, Runoff forecasting.
Identifiers: *Elevation-temperature relationships.

Rainfall-runoff relations in New England and New York have been shown to vary widely from basin to basin in a manner related to average basin latitudes and elevations. Station elevations and latitudes have been shown to be related to average temperatures. Average monthly and annual temperatures were computed for each basin sampled and average weekly basin temperatures estimated. These weekly temperatures were used to derive an index of average antecedent basin temperature based on a logarithmic recession. Two rainfall-runoff relationships were derived in which the index of antecedent basin precipitation, the index of average antecedent basin temperatures corresponding to the season of the storm, the average annual basin temperature, storm rainfall, and storm runoff were used. One of these relations applied to the spring and summer, the other to the fall and winter. Testing showed that a large part of the variation in the rainfall-runoff relationship had been removed. It was concluded that average basin temperatures can be used with profit in computing runoff in New England and New York.
W71-06967

EVAPORATION AND CLIMATE - A STUDY IN CAUSE AND EFFECT,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02D.
W71-07034

GLACIER SURVEYS IN BRITISH COLUMBIA 1968: VOLUME 1 - ENGLISH SYSTEM; VOLUME 2 - METRIC SYSTEM,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02C.
W71-07037

A HYDROLOGIC MODEL OF THE BEAR RIVER BASIN,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 04A.
W71-07056

2B. Precipitation

TRITIUM LOSS FROM WATER EXPOSED TO THE ATMOSPHERE,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 02K.
W71-06456

ATMOSPHERIC TECHNETIUM-99,
East Texas State Univ., Commerce. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-06457

PROBLEMS OF THROUGHFALL AND INTERCEPTION ASSESSMENT UNDER TROPICAL FOREST,
University Coll., Dar-es-Salaam (Tanzania).
For primary bibliographic entry see Field 02I.
W71-06474

ALASKA-TEN YEAR COMPREHENSIVE PLAN FOR CLIMATOLOGIC AND HYDROLOGIC DATA.
For primary bibliographic entry see Field 06B.
W71-06521

THE REPRESENTATION OF STORM PRECIPITATION FIELDS NEAR GROUND LEVEL,
California Univ., Davis.
J. Amorocho, and A. Brandstetter.
Journal of Geophysical Research, Vol 72, No 4, p 1145-1164, February 15, 1967. 20 p, 12 fig, 3 tab, 12 ref. OWRR Project B-005-CAL (5).

Descriptors: *Precipitation (Atmospheric), *Distribution patterns, *Rain gages, *Statistical models, Mathematical models, Network design, Rainfall disposition, Mathematical studies, Statistics, Probability, Rainfall-runoff relationships.
Identifiers: Rain gage networks.

The patterns of precipitation near the ground surface during a storm can be described by a filtered input field, which is amenable to mathematical statement and analysis. The filtered input field is generated by a process of smoothing of recording rain gage data, and it reveals the trends of the storm that are significant from the hydrological standpoint. For this purpose, techniques of curve and surface fitting based on the use of the three-parameter gamma distribution and low-order nonorthogonal polynomials were developed and applied to the analysis of precipitation events over a California watershed. These methods can be used for the establishment of criteria for precipitation network design and for the analysis of watersheds as nonlinear systems with distributed input fields. (Knapp-USGS)
W71-06658

HEAT AND WATER REGIME OF SOME SIBERIAN REGIONS (Russian: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiri).
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).
For primary bibliographic entry see Field 02A.
W71-06707

A HYDROLOGIC-CLIMATIC DESCRIPTION OF THE WEST SIBERIAN PLAIN (Russian: Gidrologo-Klimaticheskaya Kharakteristika Zapadno-Sibirskoy Ravniny),
V. S. Mezentsev, and I. V. Karnatsevich.
In: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiri, Leningrad, 'Nauka', p 23-42, 1970. 20 p, 25 fig, 10 tab, 32 ref.

Descriptors: *Hydrologic data, *Heat balance, *Water balance, *Land reclamation, *Meteorological data, Moisture content, Moisture deficit, Seasonal, Precipitation (Atmospheric), Evaporation, Drainage, Irrigation, Runoff.
Identifiers: *Western Siberia, Moisture surplus.

The natural heat and water balances and resources of Western Siberia are discussed in connection with required norms for hydrologic reclamation of the area. Results are presented in the form of tables and isogram maps showing heat and water balances along with various moisture and heat supply characteristics of the area. A detailed method for refining precipitation totals and for determining moisture content is accompanied by average long-term monthly, seasonal and annual precipitation maps and by maps depicting the annual runoff layer and total evaporation. Heat, precipitation and evaporation surpluses and deficiencies in various physico-geographic zones of the plain are calculated and serve as valid zonal specifications for hydrologic reclamations. Analysis and summarization of the calculations have established that a moisture excess and heat deficiency in the northern part of Western Siberia call for drainage measures, while the southern part of the plain requires irrigation to counter a severe moisture shortage. (See also W71-06707) (Josefson-USGS)
W71-06712

OBSERVATIONS OF RAIN AND HAIL GUSHES AFTER LIGHTNING,
Little (Arthur D.), Inc., Cambridge, Mass.
C. B. Moore, B. Vonnegut, E. A. Vrablik, and D. A. McCaig.
Available from NTIS as AD-713 255, $3.00 in paper copy, $0.95 in microfiche. Paper, 10th Weather Radar Conference, Wash, D.C., April 22, 1963. 16 p, 26 ref.

Descriptors: *Thunderstorms, Correlation analysis, *Rainfall, *Precipitation intensity, Telemetry, Instrumentation, *Hail, Clouds, *Radar, Lightning, New Mexico.
Identifiers: Correlation techniques, Meteorological radar, Radar echo areas.

Observations of thunderstorms in New Mexico were made with a vertically-scanning, 3 cm radar on a mountain-top. Prior to a lightning stroke the radar echo was usually quite weak indicating precipitation echoes of 5 mm hr-1 or less. Following the lightning stroke it was observed that in the region of the cloud where the stroke took place the radar echo intensity rapidly increased and a gush of rain or hail fell nearby. In some cases after the lightning stroke there were regions in the cloud where the low radar reflectivity decreased instead of increased. These measurements confirm earlier radar observations, made by the authors at Grand Bahama Island B.W.I., which showed that lightning strokes are often followed by the detection of a rapidly-intensifying echo and then by a gush of rain at the ground. The increases and decreases in radar reflectivity in small volumes of the cloud following lightning suggest that the electric discharge is influencing the nature of particles in the cloud.
W71-06798

RAIN-GAUGING PROGRAM TO PROVIDE GUIDE TO STORM SEWER DESIGN,
For primary bibliographic entry see Field 08B.
W71-06964

THE YEARLY DISTRIBUTION OF RAINFALL INTENSITIES,
A. L. H. Gameson, and R. D. Quaife.
Meteorol Mag, Vol 94, No 1115, p 173-180, 1965.

Descriptors: *Rain gages, *Rainfall-runoff relationships, *Hydrologic data.
Identifiers: *Storm sewage, *Great Britain.

Autographic rain-gages were installed at Bradford and Brighouse, Yorks., and Northampton during investigations of the flow and composition of storm sewage. The Northampton data were studied in detail in an attempt to compare the observed runoff distribution from an impermeable area of 115 acres with that calculated from the rainfall pattern. An equation used in the calculation of the probable yearly duration of rainfall intensities exceeding any particular value in inches per hour at a station with a given annual rainfall is presented.
W71-06965

AVERAGE INTENSITY OF RAINFALL FOR USE IN THE RATIONAL FORMULA,
For primary bibliographic entry see Field 02A.
W71-06966

SPATIAL CORRELATIONS OF STORM, MONTHLY AND SEASONAL PRECIPITATION,
For primary bibliographic entry see Field 07A.
W71-06968

MESOSCALE SPATIAL VARIABILITY IN MIDWESTERN PRECIPITATION,
F. A. Huff, and W. L. Shipp.
J Appl Meteorol, Vol 7, No 5, p 886-891, Oct 1968.

Descriptors: *Rain gages, *Precipitation (Atmospheric), Illinois.
Identifiers: *Variability analysis.

Data from four dense rain gage networks operated for periods of 7 to 12 years on areas of 10 to 550 sq mi in Illinois were used to determine spatial relative variability of monthly and extended period precipitation of storms in continental climate typical of midwestern United States. The relation of storm variability to areal mean precipitation, storm duration, precipitation type, synoptic weather type, season, and size of sampling area was investigated.
W71-06969

AMOUNT OF PRECIPITATION AND SNOW ACCUMULATION AT VOSTOK STATION,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W71-07015

2C. Snow, Ice, and Frost

FORMATION OF ANTARCTIC BOTTOM WATER IN THE WEDDELL SEA,
Coast Guard, Washington, D.C. Oceanographic Unit.
James M. Seabrooke, Gary L. Hufford, and Robert B. Elder.
Journal of Geophysical Research, Vol 76, No 9, p 2164-2178, March 20, 1971. 15 p, 15 fig, 1 tab, 19 ref.

Descriptors: *Sea water, *Salinity, *Water temperature, *Antarctic, Water circulation, Ocean currents, Ocean circulation, Oceanography.
Identifiers: *Weddell Sea.

During the austral summers of 1968 and 1969, the USCGS Glacier penetrated the pack ice of the Weddell Sea to over 75 deg S. A total of 83 hydrographic stations were conducted during the two expenditions for analysis of temperature, salinity, sissolved oxygen, and nutrients. The data revealed a cold saline layer of water on the continental shelf below a depth of 200 meters in the southwestern Weddell Sea. This water mass is formed by alteration of coastal current water as it flows along and beneath the vast ice shelves in the southern Weddell Sea. The altered coastal current water then mixes with warm deep water along the continental slope in approximately 1:2 to form antarctic bottom water. The mixing ratio is confirmed by using core values of preformed phosphate and performed nitrate concentrations as conservative properties. Antarctic bottom water then flows out of the Weddell Sea between 50 and 15 deg W longitudes and 60 and 65 deg S latitudes. Bottom water flows into the Weddell Sea from the east near the Coats Land coast and is entrained into the antarctic bottom water flowing out. (Knapp-USGS)
W71-06469

USE OF SIDE-LOOKING AIR-BORNE RADAR FOR SEA ICE IDENTIFICATION,
Coast Guard, Washington, D.C. Applied Sciences Div.
For primary bibliographic entry see Field 07B.
W71-06470

MEASURING ILLUMINATION WITHIN SNOW COVER WITH CADMIUM SULFIDE PHOTO RESISTORS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
James D. Bergen.
USDA Forest Service Research Note RM-181, 1970. 4 p, 3 fig, 6 ref.

Descriptors: *Photometry, *Snowpacks, *Solar radiation, *Telemetry, Instrumentation, Remote sensing, Snow surveys, Water equivalent, Albedo, Ice.
Identifiers: *Photometers.

Light-sensitive cadmium sulfide resistors can measure the downward flux of sunlight in the snow cover. When the variation of sensor response and the absorptivity of ice are considered together with the approximate distribution of energy in the solar spectrum, the variation of cell resistance may be used to estimate light attenuation. (Knapp-USGS)
W71-06495

GRAVIMETRIC ICE THICKNESS DETERMINATION, SOUTH CASCADE GLACIER, WASHINGTON,
Geological Survey, Tacoma, Wash.
Robert M. Krimmel.
Northwest Science, Vol 44, No 3, p 147-153, 1970. 7 p, 3 fig, 3 ref.

Descriptors: *Glaciers, *Gravity studies, *Surveys, Sounding, Washington, Gravimeters, Data collections, Density, Geophysics, Depth.
Identifiers: *Glacier surveys, *Ice thickness (Glaciers).

The vertical dimension of a glacier is the most difficult to measure directly, requiring a large number of expensive bore holes. Of the indirect methods, gravimetric seems most practical because of the large density contrast between ice and rock, known upper surface, and simple field procedure. A gravimetric analysis was carried out on the South Cascade Glacier. This is a small valley glacier (approximately 1 km wide and 3 km long) in the North Cascades of Washington. A Worden model no. 358 gravimeter was used. A bedrock base station was established, and all readings were tied to it in loops not exceeding three hours. Instrument drift was corrected by using this base as a standard and assuming a linear time relationship. A bedrock map based on crevasse patterns and surface velocities agrees fairly well with the gravimetric determination. Combined with other estimations, gravity data can be very useful for determining the bedrock topography. (Knapp-USGS)
W71-06508

SLAMTRANSPORTUNDERSOKELSER I NORSKE BRE-ELVER 1969 (SEDIMENT TRANSPORT STUDIES AT SELECTED GLACIER STREAMS IN NORWAY 1969) (Norwegian),
Norwegian Water Resources and Electricity Board, Oslo.
For primary bibliographic entry see Field 02J.
W71-06694

DYNAMICS OF ICE-LENS FORMATION IN THE VALLEY OF THE ULAKHAN LEGLIYER RIVER, SOUTHERN YAKUTSK, ASSR (Russian: Dinamika Naledi v Doline R. Ulakhan Legliyer),
V. R. Alekseyev, Yu. A. Gladkiy, and Z. G. Ustinova.
In: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiria, Leningrad, 'Nauka', p 108-111, 1970. 4 p, 3 fig, 1 tab.

Descriptors: *Ice, *Discharge (Water), *Permafrost, Surface waters, Frozen ground, Thawing, Rainfall intensity, Freezing, Groundwater, Base flow, Geomorphology, Seasonal, Permafrost.
Identifiers: Yakutsk, ASSR.

The purpose of this paper is to examine ice-lens formation of subpermafrost waters in the valley of one of the Timpton River tributaries (Aldan shield). The ice-lens regimen is closely related to that of ice-forming sources. Three types of water participate in the ice-lens formation during the initial period (November and December): surface, superpermafrost and subpermafrost. Increase in the ice-lens area and thickness is greatest at this time, followed by an uneven development of ice-forming processes, i.e., intensive outflow of ice-forming waters (mainly subpermafrost) alternating with gradual decrease in source discharges. It is assumed that such rhythmic character is due to periodic freezing of the upper parts of outcropping unfrozen spots. Thawing of the ice layer, which begins in May and ends by early August, is most intense during periods of prolonged heavy rain. (See also W71-06707) (Josefson-USGS)
W71-06708

OROGRAPHIC TEMPERATURE INVERSION OF AIR IN EASTERN SIBERIA AND ITS ROLE IN THE FORMATION OF PERENNIALLY FROZEN ROCKS. (Russian: Orograficheskaya Temperaturnaya Inversiya Vozhduka v Vostochnoy Sibiri i Yeye Rol' v Formirovanii Mnogoletnemerzlykh Gornykh Porod),
V. R. Alekseyev, and G. N. Filosofova.
In: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiri, Leningrad, 'Nauka', p 102-107, 1970. 6 p, 5 fig, 4 tab.

Descriptors: *Air temperature, *Heat budget, *Thermal stratification, *Permafrost, Orography, Mountains, Geomorphology, Climatic data, Regional analysis, Air-earth interfaces, Seasonal fluctuations.
Identifiers: *Eastern Siberia, Yakutsk ASSR, Temperature inversion.

Data from regimen observations of orographic temperature inversion of a mountain-taiga landscape in Eastern Siberia have established that an inversion layer is formed almost the year-round in areas with a severely dissected plateau relief. The magnitude of inversion, its continuance and the thickness of the inversion layer are considerably greater in winter than during other periods of the year. Orographic temperature inversion of the air has an appreciable effect on the temperature regimen of rocks by lowering the level of heat exchange between the atmosphere-soil and the lithosphere. In the mountain-taiga regions of southeastern Siberia where the average heat exchange level approaches 0 deg. C, inversion leads to a formation of a layer of perennially frozen rocks in valleys and to an increase in their thickness in other regions. The presence of inversion and its high average annual values in Eastern Siberia call for corrections to meteorological observation data used in the calculation of seasonal thawing and freezing depths and in the thermal melioration of soils and rocks. Numerical inversion values should also be considered in any hydrologic regionalization. (See also W71-06707) (Josefson-USGS)
W71-06709

ANNOTATED BIBLIOGRAPHY ON SNOW AND ICE PROBLEMS,
Toronto Univ., Ontario, Canada. Dept. of Geography.
E. C. Relph, and S. B. Goodwillie.
Natural Hazard Research Working Paper No 2, 1968. 13 p.

Descriptors: *Bibliographies, *Snow, *Ice, *Cities, *Snow removal, *Snow management, Melting, Snow cover, Hazards, Deicers, Equipment, Publications, Abstracts, Roads, Governments, Legal aspects, Social aspects, Warning systems.
Identifiers: *Urban snow control.

This paper, a bibliography of 126 references on snow and ice problems, is one in a series on research in progress in the field of human adjustments to natural hazards. It is intended that these papers will be used as working documents by the group of scholars directly involved in hazard research as well as inform a larger circle of interested persons. The annotated bibliography lists publications including bibliographies and general studies, meteorological and climatic studies, studies of the impact of snowfalls, perception of the snow hazard, methods and costs of snow removal and ice control, and methods of snow removal. (Knapp-USGS)
W71-06719

THE INFLUENCE OF THE SOIL-FORMATION PROCESS ON THE COMPOSITION AND PROPERTIES OF THE DEPOSITS OF THE SEASONALLY FREEZING AND SEASONALLY THAWING LAYERS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
L. N. Maksimova.
Available from NTIS as AD-711 888, $3.00 in paper copy, $0.95 in microfiche. Translation of Shornik PO Merzlotovedenigu, Vol 5, No 7, p 87-97, 1967. CRREL Translation, 1970. 13 p.

Descriptors: *Freezing, *Thawing, *Thermal conductivity, *Soil structure, Soil physical properties, Melting, Peat, Humus, Podzols, Moisture, Porosity.
Identifiers: Organic materials, Decomposition, Deposits, USSR, Translations.

Data are cited which indicate the complex and multiform influence of the soil-forming process on the composition, properties, and structure of the seasonally freezing and seasonally thawing layers.
W71-06784

AREAL VARIABILITY OF SNOW COVER CHARACTERISTICS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
T. S. Trifonova.
Available from NTIS as AD-711 868, $3.00 in paper copy, $0.95 in microfiche. Translation of Trudy Glavnoy Geofizicheskey Obserostorii meni A I Voyeykooa, No 130, p 29-37. CRREL Translation, 1970. 14 p.

Descriptors: *Snow cover, *Snow surveys, Density.
Identifiers: Density, USSR, Translations.

The article gives information on the variability in the height and density of snow cover, as well as on the accuracy of determining them in various physical-geographic regions.
W71-06785

THE PROBLEM OF FORMATIONS OF THE ION COMPOSITION AND MINERALIZATION OF FRESH WATER ICE UNDER VARIOUS CONDITIONS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
I. M. Korenouskaya, and M. N. Tarasov.
Available from NTIS as AD-711 873, $3.00 in paper copy, $0.95 in microfiche. Translation of Gidrokhimicheskiy Materialy, Hydrochemical Institute, Novocherkassk, Vol 47, p 77-87, 1968. CRREL Translation, 1970. 20 p.

Descriptors: *Ice, *Salinity, *Sea ice, *Freezing, Chlorides, Sulfates, Carbonates.
Identifiers: USSR, Translations.

The research discussed pursued three main goals: Establishment of the nature of the dependence of the concentration of various ions (Cl (-), SO4 (-2), HCO3 (-)) in the ice on their concentration in the initial solution; Establishment of the nature of the dependence of the concentration of various ions in the ice on the freezing temperature (or, the equivalent, the ice formation rate); and Discovery of whether the standard natural water solutions of the corresponding chemical composition are subject to these relations.
W71-06786

COMPUTING THE FORMATION OF ICE INTERLAYERS IN FREEZING MOIST SOIL,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08D.
W71-06787

NOMOGRAMS FOR CALCULATING THE DEPTHS OF PERENNIAL FREEZING OF ROCKS AND THERMAL CYCLES WITHIN THEM,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08E.
W71-06789

PROBLEMS IN THE THEORY AND PRACTICE OF ARTIFICIAL FREEZING OF SOIL,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08D.
W71-06791

A STUDY OF THE HARDNESS OF ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
M. M. Khrushchov, and E. S. Berkovich.
Available from NTIS as AD-716 457, $3.00 in paper copy, $0.95 in microfiche. Translation of: Izvcheniye tverdosti l'da, USSR Academy of Sciences Publishing House. CRREL Translation, Hanover, NH, 1970. 47 p, 25 ref.

Descriptors: *Ice, *Permafrost, *Cold weather construction, *Frozen soils, Snow, Compressability, Loads.
Identifiers: *Ice, Cold weather tests, Brittleness, USSR, Translations.

The present monograph is intended as a systematic presentation of data collected on the hardness of ice by the present authors and other investigators using various methods. It is believed that the monograph will be of general interest to scientists and engineering technical workers concerned in any way with ice, frozen soil, or snow at low temperatures.
W71-06924

THE GENERATION OF ELECTROMOTIVE FORCES DURING THE FREEZING OF WATER,
Columbia Univ., New York. Stanley Thompson Labs.
E. J. Murphy.
Available from NTIS as AD-716 726, $3.00 in paper copy, $0.95 in microfiche. Journal of Colloidal and Interface Science, Vol 32, No 1, p 1-11, Jan 1970. 31 ref.

Descriptors: *Freezing, *Water properties, *Electrolytes.
Identifiers: Electrostatic fields, Molecular association, Electric potential, *Electromotive forces, *Hydrogen bonds.

The electromotive force generated by freezing degassed water in racuo is approximately the same as that generated in water containing dissolved air. The freezing potentials of dilute solutions were measured as a function of concentration. At the higher concentrations the potential is ice-negative, at lower concentrations ice-positive, with respect to the water. The freezing potential for all dilute solutions investigated (except NH4Cl) passes through zero at some concentration in the range 10 to -6 to 10 -5M. The ice-positive potentials are often as high as 120 volts, the ice-negetive ones usually less than 30 volts. The ice-negative potentials are attributed to the entrapment of anions in excess in the ice. To account for the fact that a wide range of chemically different anions are entrapped in excess, the discrimination between ions in the entrapment process is attributed to the hydration shells of the ions. For cations the dipoles are predominantly directed outward, for anions inward leading to an activation energy for capture which is different for oppositely oriented hydration shells.
W71-06925

THE INFLUENCE OF THE RADIATION FACTOR ON THE GROWING AND SHRINKING OF GLACIERS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
F. Sauberer, and I. Dirmhirn.
Available from the National Technical Informati Service as AD-711 859, $3.00 in paper copy, $0.! in microfiche. Waterways Experiment Stati Translation No 51-1, Vicksburg, Miss, 1951. 21 14 ref.

Descriptors: *Glaciers, *Melting, *Ablatic *Solar radiation, Cloud cover, Albedo, Precipit tion.
Identifiers: Austria, Translations.

The different factors governing the radiati processes to which alpine glaciers are exposed; I coming radiation; Outgoing radiation; The da radiation balance; The effect of the variations the radiation factors.
W71-06935

GEOMORPHOLOGY OF THE FILDES PENI SULA ON KING GEORGE (WATERLO ISLAND,
USSR Arctic and Antarctic Scientific Resear Inst., Leningrad, Dept. of Geographical Sciences
For primary bibliographic entry see Field 02J.
W71-07013

RADAR SOUNDING OF ANTARCT GLACIERS IN THE SUMMER OF 1967/68,
Arkticheskii i Antarkticheskii Nauchno-I ledovatelskii Institut, Leningrad (USSR).
A. I. Kozlov, and B. A. Fedorov.
Translated from Informatsionnyi Byulleten' Sov skoi Antarticheskoi Ekspeditsii, No 71, p 53, 19 Soviet Antarctic Expedition Information Bullet Vol 7, No 3, p 208-212, January 1971. 5 p, 4 fig.

Descriptors: *Sounding, *Glaciers, *Antarct *Radar, Remote sensing, Profiles, Mapping, I Geomorphology, Surveys.
Identifiers: *Antarctica.

The radio physics group of the Thirteenth Sov Antarctic Expedition made radar soundings glaciers in the Molodezhnaya Station area betw December 1967 and March 1968. Ice thickn was determined seismically (vertical sounding) ten points along the traverse. The surface unde ing the ice is strongly dissected. The only except is the section from the coastline to the 35-km ma The bed has probably been smoothed here by glacier flowing to the sea. (Knapp-USGS)
W71-07014

AMOUNT OF PRECIPITATION AND SNO ACCUMULATION AT VOSTOK STATION,
Arkticheskii i Antarkticheskii Nauchno-I ledovatelskii Institut, Leningrad (USSR).
V. G. Aver'yanov.
Translated from Informatsionnyi Byulleten' Sov skoi Antarticheskoi Ekspeditsii, No 72, p 5, 19 Soviet Antarctic Expedition Information Bulle Vol 7, No 3, p 238-241, January 1971. 4 p, 2 fi tab, 3 ref.

Descriptors: *Snowfall, *Antarctic, Precipitat gages, Water equivalent, Precipitation (mospheric), Water balance, Climatolo Meteorology.
Identifiers: *Antarctica, *Vostok Station (Ant tica).

Vostok Station, Antarctica, conducted simulta ous precipitation and snow accumulation obse tions between 1958 and 1961, and 1963 and 19 The precipitation sum measured by the Tret'ya gage in 9 years of observation was 342 mm o average of 38 mm/year. Snow accumulation determined from systematic (once every 10 day once a month) measurements of the height of snow surface and the specific weight of the sn Snow cover depth was measured with a stake g uated in centimeters at every meter of a c stretched along a profile with sides each 20 m l Total snow accumulation in 9 years was 225.7 of water or an average of 25.1 mm/year. Thus, sum of precipitation exceeded accumulation

50%. This value (1/3) is probably the fraction of the total amount of measured precipitation due to snow blown into the gage. However, this does not take into account the evaporation of snow in summer. Most of the precipitation falls and accumulates during the cold period, from May to October. (Knapp-USGS)
W71-07015

STUDY OF ICE MOVEMENT IN ENDERBY LAND IN 1967,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
M. P. Koshelev, and M. V. Aleksandrov.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 72, p 18, 1968. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 3, p 242-246, January 1971. 5 p, 2 fig, 3 tab, 7 ref.

Descriptors: *Glaciers, *Antarctic, *Surveys, *Movement, Regimen, Icebergs, Rheology, Velocity.
Identifiers: *Antarctica, *Enderby Land (Antarctica).

The results are given of a study of a slow-moving section of ice, located between the Campbell and Hays outlet glaciers, Antarctica. The distance between these glaciers along the coastline is about 40 km, but the ice calves into the ocean across a section not exceeding 16 km in width because of the Thala Hills and other ice-free coastal areas. Ice velocity is small (1-4 m/year). At present, these speeds seem to be characteristic of areas of the Antarctic ice sheet blocked by oases. (Knapp-USGS)
W71-07016

STUDY OF LAKES IN THE VICINITY OF MOLODEZHNAYA STATION,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02H.
W71-07018

PROBLEM OF THE AMOUNT OF SNOW ACCUMULATING IN CENTRAL ANTARCTICA,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
V. G. Aver'yanov.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 73, p 5, 1969. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 4, p 285-287, February 1971. 3 p, 1 tab, 8 ref.

Descriptors: *Snowfall, *Water equivalent, *Antarctic, *Precipitation gages, Precipitation (Atmospheric), Radioisotopes, Stable isotopes, Tracers, Snowpacks, Stratigraphy, Snow surveys.
Identifiers: *Antarctica, *Vostok Station (Antarctica).

Correct determination of the amount of snow accumulating in Central Antarctica is extremely important for computing the mass gain of the Antarctic ice sheet. The most reliable accumulation data can be obtained by using snow surveys in conjunction with the stratigraphic method (supplemented by the determination of the age of snow with natural and artificial radioisotopes) and comparison of stratigraphic data (including the results of isotope analyses) with snow survey data. The average accumulation rate at Vostok Station is 25-30 mm/year, as determined by three different methods. Accumulation at Vostok Station can be compared with observations at other points in Central Antarctica where the precipitation and deposition conditions are practically the same. (Knapp-USGS)
W71-07020

TEMPERATURE REGIME OF THE CONTINENTAL ICE SHEET IN ENDERBY LAND,
V. Ya. Freyfel'd.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 73, p 10, 1969. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 4, p 287-290, February 1971. 4 p, 2 fig, 3 tab.

Descriptors: *Ice, *Temperature, *Antarctic, *Seasonal, *Variability, *Heat flow, Heat transfer, Heat balance, Heat budget, Climates, Melting, Ablation.
Identifiers: *Antarctica, *Enderby Land (Antarctica).

Observations on the temperature of the firm-ice layer of the continental ice sheet near the shore of Alasheyev Bight (Enderby Land) Antarctica, were carried out from April 10 through November 21, 1967. The measurements were made in a snow-filled hole approximately 4 km from the shore at an elevation of 280 m above sea level. The hole was made on the ice slope in a region of prevailing snow removal. In the immediate vicinity of the hole were areas that were bare of snow throughout the year. Snow depth at the mouth of the hole was small (from 11 to 35 cm, averaging 18 cm) throughout the observation period and had no significant effect on the temperature regime of the firn-ice layer. The active layer extends to a depth of 17 m in the upper part of the firn-ice cover. The depth of penetration of brief (1-6 days) temperature fluctuations with a systematic reversal of the sign of the gradient does not exceed 0.5-0.6 m. Prolonged intraseasonal temperature fluctuations penetrate to a depth of 2 m in the firn-ice layer. The depth of penetration of seasonal temperature fluctuations, corresponding to the cold and warm periods, reaches 12-13 m. The temperature of the firn-ice layer at the level of attenuation of annual fluctuations is -13 deg C. (Knapp-USGS)
W71-07021

SNOW ACCUMULATION BETWEEN MOLODEZHNAYA STATION AND THE 200-KM MARK,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
S. S. Chikovskiy, N. A. Kornilov, and G. V. Konovalov.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 73, p 62, 1969. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 4, p 315-317, February 1971. 3 p, 1 fig, 3 ref.

Descriptors: *Snowfall, *Snowpacks, *Antarctica, *Snow surveys, Precipitation (Atmospheric), Regimen, Water balance, Climates, Weather, Temperature, Topography.
Identifiers: *Antarctica.

In March 1964 a marked course was laid out in Antarctica from Molodezhnaya Station to the 200-km mark on the continental ice plateau, the markers serving also as snow stakes. Ice thickness was determined by radar, and glaciological observations, including measurements of the increment of snow and its density and determination of the direction and shape of sastrugi, made in a traverse to the 140-km mark in January-February 1968. The profile begins 8 km from the station at an elevation of about 300 m and runs due south. It curves a bit only at 69 deg 00'S to bypass a crevasse zone, and terminates at 60 deg 30'S at an elevation of 2100 m. Repeated observations made it possible to determine total snow accumulation between March 1964 and January 1968.
W71-07022

ON THE POSSIBILITY OF USING METEOROLOGICAL SATELLITE OBSERVATIONS FOR THE STUDY OF ANTARCTIC ICE,
For primary bibliographic entry see Field 07B.
W71-07023

GLACIER SURVEY IN ALBERTA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
P. I. Campbell, I. A. Reid, and J. Shastal.
Copies available from Director, Inland Waters Branch, Dept. of Energy Mines and Resources, 588 Booth St., Ottawa, Ont, Canada. Canada Dept of Energy, Mines and Resources, Inland Waters Branch Report Series No 4, 1969. 15 p, 6 fig, 2 maps, 10 tab.

Descriptors: Surveys, *Glaciers, Regimen, Water storage, Data collections, Water resources, Hydrologic data, Topography.
Identifiers: *Canada, *Alberta (Canada).

Because glaciers form part of Canada's water resources, some glaciers are surveyed on a continuing basis by the Water Survey of Canada in an effort to determine the extent and pattern of a glacier's influence on surface water runoff. This report summarizes the history of glacier surveys conducted in Canada by the Water Survey of Canada and describes present glacier survey practices. Tables of results for the period of record, some interpretation of these results and the most recent glacier maps are also inclucded. (Knapp-USGS)
W71-07033

GLACIER SURVEYS IN BRITISH COLUMBIA 1968: VOLUME 1 - ENGLISH SYSTEM; VOLUME 2 - METRIC SYSTEM,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
I. A. Reid, and J. Shastal.
Copies available from Director, Inland Wates Br., Dept. of Energy, Mines and Resources, 588 Booth St., Ottawa, Canada. Canada, Inland Waters Branch Water Survey, Department of Energy, Mines and Resources, Report Series No 10, 1970. 26 p, 6 fig, 5 map, 31 tab. Published as 2 volumes, under separate covers.

Descriptors: *Glaciers, *Surveys, *Mapping, *Water resources development, *Aerial photography, Regime, Ablation, Melting, Water yield, Streamflow forecasting, Runoff, Runoff forecasting, Snow surveys.
Identifiers: *Canada.

Because glaciers form part of Canada's water resources, some glaciers are surveyed on a continuing basis by the Water Survey of Canada in an effort to determine the extent and pattern of a glacier's influence on surface water runoff. This report summarizes the history of glacier surveys conducted in Canada by the Water Survey of Canada and describes present glacier survey practices. Tables of results for the period of record, some interpretation of these results and the most recent glacier maps are also included. During the summer of 1964, high-quality maps of five selected glaciers in British Columbia were prepared by stereoscopic terrestrial photogrammetric methods. In response to a Branch directive recommending greater use of the metric system, the Water Survey of Canada decided to change from the English to the Metric System in determination of biennial glacier variations. Because 1968 is the year of changeover, it was necessary to compile separate sets of maps using both the English and Metric Systems. (Knapp-USGS)
W71-07037

SNOW FORECASTING FOR SOUTHEASTERN WISCONSIN,
Weather Service Office, Milwaukee, Wis.
Rheinhart W. Harms.
Available from National Technical Information Service as COM-71-00119, $3.00 in paper copy, $0.95 in microfiche. National Oceanic and Atmospheric Administration Technical Memorandum NWSTM CR 38, November 1970. 13 p, 4 fig, 7 ref.

Descriptors: *Weather forecasting, *Snowfall, *Weather patterns, *Wisconsin, *Meteorology, Weather data, Data processing.
Identifiers: *Snow forecasting.

The accuracy of forecast snow accumulation for a particular area depends to a great extent upon the predictability of the track of the associated surface Low center. Of four basic track types which produce heavy snows in southeastern Wisconsin and the lower Great Lakes region, two can be readily recognized in their early stage of development and their deviations are less pronounced and less common. Models constructed of various types of storms indicate most precipitate their heaviest snow 120 to 140 nautical miles to the left of the track of the surface Low depending on the intensity of the storm and the precipitable water available along the storm track. Snow amounts in the heavy snow band correlate very well with the forecast precipitable water in advance of the storm along the storm track. (Knapp-USGS)
W71-07041

2D. Evaporation and Transpiration

ADSORPTION,
American Chemical Society, Washington, D.C.
Joseph H. S. Haggin.
Chemistry, Vol 44, No 4, p 6-9, April 1971. 4 p, 2 fig, 1 tab, 3 ref.

Descriptors: *Adsorption, *Gases, *Water vapor, Oceans, Molecular structure, Evaporation, Heat transfer, Hydrology, Diffusion, Surfaces, Surface tension.

Characteristics of the adsorption of gases to surfaces are described. If a surface is a good desiccant, adsorption of water vapor (drying of the wet material) must occur at a fantastic rate. In fact, for most purposes, adsorption is instantaneous. In most cases, drying of a material or evaporation of a liquid does not occur instantaneously but requires a relatively long time. For instance, the oceans don't dry up but remain at a fairly constant level. Why. Obviously something other than absorption must be involved. If only evaporation of water by desorption from the surface is involved, the maximum possible rate for pure water is about 235 grams per square cm per second. At this rate, the oceans would evaporate totally in a few days. The evaporation rate is controlled by the necessity for evaporated molecules to diffuse through a virtually stagnant layer of water vapor at the ocean's surface. Diffusion is a very slow process. A forest of trees evaporates much more water in a given time than an equal area of ocean surface. (Woodard-USGS)
W71-06463

QUANTITATIVE SLOPE ASPECT DETERMINATION,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 07C.
W71-06476

CALCULATION OF CERTAIN ASPECTS OF THE HEAT AND WATER BALANCE FOR THE LAKE BAYKAL REGION (Russian: Raschet Nekotorykh Elementov Teplovogo i Vodnogo Balansov Dlya Territorii Pribaykal'ya),
N. S. Berkin.
In: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiri, Leningrad, 'Nauka', p 43-57, 1970. 15 p, 8 fig, 4 tab, 20 ref.

Descriptors: *Heat balance, *Water balance, *Hydrologic data, *Meteorological data, Evaporation, Moisture content, Runoff, Precipitation (Atmospheric), Meteorology.
Identifiers: Irkutsk Oblast.

Annual values for radiation balance, maximum possible evaporation, total evaporation and total moisture in the Irkutsk Oblast are examined on the basis of average long-term hydrometeorological indices. Particular attention is paid to the methodology and formulas used to determine these characteristics. To calculate annual radiation balance values, an empirical formula is used which associates radiation balance with latitude and height of a point. Maximum possible evaporation, total moisture and total evaporation are computed according to the method of V.S. Mezentsev and are represented on accompanying maps in the form of isograms. Although approximate, these maps show the relationship between water and heat balances and the landscape conditions of the area. Further study in this direction can provide a basis for hydrologic regionalization of the Irkutsk Oblast. (See also W71-06707) (Josefson-USGS)
W71-06711

A HYDROLOGIC-CLIMATIC DESCRIPTION OF THE WEST SIBERIAN PLAIN (Russian: Gidrologo-Klimaticheskaya Kharakteristika Zapadno-Sibirskoy Ravniny),
For primary bibliographic entry see Field 02B.
W71-06712

MOVEMENT OF A MONOMOLECULAR FILM UNDER THE INFLUENCE OF A STEADY WIND,
Bureau of Reclamation, Denver, Colo.
L. A. Dayan.
Available from the National Technical Information Service as PB-193 638T, $3.00 in paper copy, $0.95 in microfiche. Translated from Akademii Nauk Armianskoi SSR Izvestiia, Seriia Tekhnickeskikh Nauk, Vol 16, No 2-3, p 133-168, 1963. Bureau of Reclamation Translation No 529, Denver, Dec 1964. 12 p.

Descriptors: *Monomolecular films, *Evaporation, *Winds, *Evaporation control, Alcohols, Boundry layers, Films.
Identifiers: Coriolis force, USSR, Hexadecanois, *Water conservation, Translations, *Evaporation retarding films.

Using standard equations of motion for the wind near the water and for the water near the lake surface, a formula was derived which was used to predict the velocity with which a monomolecular film is driven across a lake by a uniform wind of a given velocity. The differential equations of motion show that the velocity of movement of the monomolecular film is proportional to the wind velocity. However, the direction of motion of the film does not coincide with the wind direction, due to the effect of the Coriolis force. According to this theoretical derivation, the ratio of wind speed to film speed is equal to 32; whereas field observations show that this ratio is approximately equal to 20. This discrepancy is attributed to the effect of various simplifying assumptions; e.g., the simplification of the equations of motion of the atmosphere, the assumption that the wind velocity is uniform, and the disregard for the effect of temperature differences between various points in the atmosphere.
W71-06934

CONTINENTAL SABKHA IN ARAVA VALLEY BETWEEN DEAD SEA AND RED SEA: SIGNIFICANCE FOR ORIGIN OF EVAPORITES,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W71-07024

EVAPORATION AND CLIMATE - A STUDY IN CAUSE AND EFFECT,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
F. I. Morton.
Canada, Inland Waters Branch, Department of Energy, Mines and Resources, Scientific Series No 4, 1968. 32 p , 13 fig, 22 ref.

Descriptors: *Evaporation, *Evapotranspiration, *Climatology, Water balance, Energy budget, Solar radiation, Soil moisture, Weather data, Meteorological data, Synoptic analysis, Evaporation pans, Hydrologic cycle.
Identifiers: *Ireland.

Evaporation from the soil and vegetation surfaces of a region depends on the availability of both water and energy. Water supply variations, by changing the amount of energy used for evaporation and the amount of heat and vapor convected to the air, have substantial effects on the weather and hence on the energy available for evaporation. As the evaporation also has an effect on the water supply there is a problem of feedback and of distinguishing cause from effect. Consideration of energy and vapor transfers suggests that the regional evaporation is equal to the absorbed insolation less the evaporation from a small continuously moist surface, that is, to the absorbed insolation less the potential evaporation, and that the potential evaporation can be calculated from several well known climatological techniques. Such a model permits the regional evaporation, a product of climatic, soil moisture and vegetative processes, to be estimated by use of evaporimeters and weather observations. Differences between annual rainfall and annual runoff for river catchments in Ireland provide reasonable confirmation of the model when compared with predicted values. Analysis of records of evaporation pans and grass evaporimeters located in various parts of Ireland provides further verification and a deeper insight into the implications of the model. (Knapp-USGS)
W71-07034

INSTRUMENTATION FOR STUDY OF ENERGY BUDGET OF RAWSON LAKE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
R. Chapil.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch Technical Bulletin No 34, 1970. 15 p, 10 fig, 2 tab, 2 ref.

Descriptors: *Energy budget, *Meteorological data, *Lakes, Methodology, Instrumentation, Wind velocity, Air temperature, Water temperature, Humidity, Precipitation (Atmospheric), Evaporation, Solar radiation.
Identifiers: *Rawson Lake (Northwestern Ontario).

This report describes equipment and procedures used and contains some graphical results obtained mainly during 1969 in the Rawson Lake study, a hydrological study of a small research basin in northwestern Ontario being carried out by several Government of Canada agencies working with University of Manitoba staff. The data collected are being used to establish climatic trends and variations; compare over-lake meteorological data with data from a Canada Department of Transport land-climatological station; determine regional radiation and energy budgets; and determine the effect of radiation and meteorological factors on lake productivity. (Woodard-USGS)
W71-07035

A STUDY OF THE WATER BALANCE OF A NATURAL CATCHMENT USING A NEUTRON-SCATTERING MOISTURE METER,
Road Research Lab., Crowthorne (England).
J. Prudhoe.
Available from National Technical Information Service as PB-195 919, $3.00 in paper copy, $0.95 in microfiche. Ministry of Transport (Crowthorne, England), Road Research Laboratory Report LR 361, 1970. 12 p, 12 fig, 2 plate, 9 ref.

Descriptors: *Rainfall-runoff relationships, *Water balance, *Soil moisture, *Nuclear moisture meters, Evapotranspiration, Hydrologic budget, Surface-groundwater relationships, Flood forecasting, Runoff forecasting, Streamflow forecasting.
Identifiers: *England.

The water balance of a natural catchment was studied by measuring change in soil moisture with a neutron-scattering moisture meter. The complete water balance was developed for both annual and monthly periods, using soil moisture and their

change in magnitude with the season. The relation between the water balances of monthly duration and of individual storms throughout the year was found; the two water balances show similar seasonal characteristics. The evapotranspiration losses and changes in soil moisture throughout the year were considered from the point of view of flood flow estimation for a given catchment. (K-napp-USGS)
W71-07042

GAMMA-RADIATION DETECTION OF WATER CONTENT IN TWO-DIMENSIONAL EVAPORATION PREVENTION EXPERIMENTS,
Iowa State Univ., Ames. Dept. of Agronomy.
D. Kirkham, D. E. Rolston, and D. D. Fritton.
In: Isotope and Radiation Techniques in Soil Physics and Irrigation Studies, Proceedings Symposium of International Atomic Energy Agency and the Food and Agriculture Organization of the United Nations, Istanbul, June 12-16, 1967: Vienna, IAEA--STI/PUB/158, Paper SM-94/21, p 3-16, 1967. 14 p, 6 fig, 9 ref. OWRR Project A-003-IA (12).

Descriptors: *Evaporation control, *Hydraulic models, *Instrumentation, *Nuclear moisture meters, Gamma rays, Mulching, Evaporation.
Identifiers: Evaporation models.

A gamma scintillation detector system was used to measure water contents in a two-dimensional soil model. The gamma apparatus was built into a lifting apparatus, which accommodates both vertical and horizontal 150 cm long soil columns and 150 by 35 cm two-dimensional soil models. Vertical movement of the gamma apparatus and horizontal movement of the model allow two-dimensional scanning. Water contents in two dimensions were determined for 2 cm simulated rainfall applications for the three treatments. When a subsurface-sand mulch was used, the mulch acted as a barrier to infiltration. Surface-sand mulches conserved more water than did the subsurface-sand mulch, but both the surface and the subsurface sand mulches conserved water as compared with no sand mulch layers. In addition, soil columns, 6.9 cm in diam. and 33 cm tall, were used to study the effectiveness of various thicknesses of surface-sand mulches in preventing evaporation. Thickness of sand mulches did not greatly influence the amount of water conserved if the sand layer was 1 cm or more thick. (K-napp-USGS)
W71-07044

2E. Streamflow and Runoff

FINITE DIFFERENCE SOLUTION OF THE FLOOD DIFFUSION EQUATION,
Birmingham Univ. (England). Graduate School of Water Resources Technology; Birmingham Univ. (England). Dept. of Civil Engineering; and Essex River Authority (England).
I. E. Thomas, and P. R. Wormleaton.
Journal of Hydrology, Vol 12, No 3, p 211-220, February 1971. 10 p, 4 fig, 7 ref.

Descriptors: *Floods, *Mathematical models, *Water level fluctuations, *Routing, Computer programs, Diffusion, Waves (Water), Theoretical analysis, Numerical analysis, Profiles, Hydrographs, Hydrograph analysis.
Identifiers: Finite difference method.

Application of the flood wave diffusion equation to routing arbitrary input hydrographs involves step computations. The finite difference solutions of the basic equation may be obtained using iteration or matrix inversion techniques. The errors in the different procedures and the digital computational times involved are compared. The Hayami method, which utilizes the closed form solution of the equation for a constant input, is reviewed. Solution of the flood diffusion equation by finite difference methods give results of very high accuracy. The highest accuracies are obtained when the sets of algebraic equations are solved by matrix inversion and the digital computer running time is simultaneously minimized. The maximum node spacing in a particular problem will be controlled by the extent of lateral inflows and in the locations of tributaries but the minimum spacing can then be decided on the basis of the error analysis. (Knapp-USGS)
W71-06472

ANALYSIS OF EXPERIMENTS ON SECONDARY UNDULATIONS CAUSED BY SURGE WAVES IN TRAPEZOIDAL CHANNELS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
For primary bibliographic entry see Field 08B.
W71-06478

THE LENGTHS OF STATIONARY WAVES ON FLOWING WATER,
Cambridge Univ. (England). Engineering Lab.; and Bataafse Internationale Petroleum Maatschappij N.V., The Hague (Netherlands).
For primary bibliographic entry see Field 08B.
W71-06479

TURBULENCE CHARACTERISTICS IN FREE SURFACE FLOWS OVER SMOOTH AND ROUGH BOUNDARIES,
State Univ. of New York, Buffalo; and Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 08B.
W71-06480

VELOCITY DISTRIBUTIONS IN WIDE, CURVED OPEN-CHANNEL FLOWS,
Imperial Coll. of Science and Technology, London (England). Dept. of Hydraulic Engineering; and Aleppo Univ. (Syria). Dept. of Engineering.
For primary bibliographic entry see Field 08B.
W71-06481

CONCEPT OF CRITICAL SHEAR STRESS IN LOOSE BOUNDARY OPEN CHANNELS,
West Virginia Inst. of Tech., Montgomery. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-06482

APPLICATIONS OF INFORMATION AND GRAPH THEORY TO MULTIVARIATE GEOMORPHOLOGICAL ANALYSES,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geological Science.
For primary bibliographic entry see Field 07C.
W71-06486

WATER RESOURCES OF SPARTANBURG COUNTY, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
W. M. Bloxham, George E. Siple, and T. Ray Cummings.
South Carolina Water Resources Commission Report No 3, 1970. 112 p, 33 fig, 1 plate, 16 tab, 24 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *South Carolina, *Hydrologic data, Data collections, Hydrogeology, Evaluation, Streamflow, Gaging stations, Flow rates, Discharge measurement, Runoff, Stream gages, Geology, Aquifers, Aquifer characteristics, Water yield, Water utilization, Water quality, Chemical analysis, Consumptive use, Meteorology, Hydrology, Water resources development.
Identifiers: *Spartanburg County (S.C.).

The results of a 3-year study of the water resources of Spartanburg County, South Carolina are presented. About 40 percent of the average rainfall in Spartanburg County becomes streamflow. The mean annual discharge of the drainage system is about 1,250 cfs or 1.5 cfs per square mile. However, streamflow is less than this amount more than 70 percent of the time, being sustained by groundwater inflow. Most streams in Spartanburg County contain water having excellent quality for domestic, industrial, and agricultural uses. The dissolved-solids content, is less than 100 mg/l at most locations. Groundwater occurs in the fractured hard rock and mantle of weathered rock throughout Spartanburg County. Well yields range from 1 to 250 gpm and average 20 gpm. The highest average yields of wells in Spartanburg County are obtained from wells drilled in the biotite gneiss and migmatite and the lowest average yields from wells in the quartz monzonite. Analyses of Glenn Springs showed the highest concentration of dissolved solids and the hardest groundwater in the county. (Woodard-USGS)
W71-06487

LOW-FLOW CHARACTERISTICS OF IOWA STREAMS THROUGH 1966,
Geological Survey, Iowa City, Iowa.
Albert J. Heinitz.
Iowa Natural Resources Council Bulletin No 10, 1970. 176 p, 6 fig, 2 plate, 2 tab, 4 ref.

Descriptors: *Streamflow, *Low flow, *Hydrologic data, *Water resources, *Iowa, Gaging stations, Flow rates, Data collections, Stream gages, Discharge measurement, Duration curves, Hydrographs, Flow characteristics, Average flow, Frequency analysis, Maps, Precipitation (Atmospheric), Runoff.
Identifiers: Streamflow characteristics, Historical data.

This report contains information on average discharge, low-flow magnitude and frequency, duration of flow, storage requirements, and regional draft-storage relations for interior streams in the State of Iowa. Data on the duration of flow are given for 113 gaging stations and on low-flow frequency for 77 gaging stations. Storage requirements for selected draft rates are given for 65 gaging stations. Annual 7-day low flows having a recurrence interval of 2 years were computed for 431 low-flow partial-record stations. For some partial-record stations, the 7-day low flow having a recurrence interval of 10 years is also given. These discharges were determined from correlations of periodic low-flow discharge measurements made at the partial-record sites and concurrent discharges at stream-gaging stations. Gaging-station records for the 26-year period 1941-66 were used to define a relationship in which average discharge is a function of size of drainage area and normal annual precipitation for the period 1931-60. The relation can be used to compute the average flow for any location on Iowa streams not significantly affected by regulation. (Woodard-USGS)
W71-06488

BLOCKING EFFECTS IN FLOW OVER OBSTACLES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics.
For primary bibliographic entry see Field 08B.
W71-06499

STREAMFLOW IN THE UPPER SANTA CRUZ RIVER BASIN, SANTA CRUZ AND PIMA COUNTIES, ARIZONA,
Geological Survey, Washington, D.C.
Alberto Condes de la Torre.
Available from SOD, Washington, DC 20402 - $1.50. Geological Survey Water-Supply Paper 1939-A, 1970. 26 p, 14 fig, 6 plate, 8 tab, 13 ref.

Descriptors: *Streamflow, *Flow measurement, *Hydrologic data, *Arizona, Flooding, Peak discharge, Low flow, Gaging stations, Precipitation (Atmospheric), Data collections, Surface-groundwater relationships, Ephemeral streams, Hydrographs, Frequency analysis, Water resources, Statistical methods.

Identifiers: *Santa Cruz River basin (Ariz).

Streamflow records obtained in the upper Santa Cruz River basin of southern Arizona, United States, and northern Sonora, Mexico, have been analyzed to aid in the appraisal of the surface-water resources of the area. Records are available for 15 sites, and the period of record ranges from 60 yr for the gaging station on the Santa Cruz River at Tucson to 6 yr for Pantano Wash near Vail. The analysis provides information on flow duration, low-flow frequency and magnitude, flood-volume frequency and magnitude, and storage requirements to maintain selected draft rates. Flood-peak information has been projected on a regional basis from which estimates of flood magnitude and frequency may be made for any site in the basin. Most streams in the 3,503 sq-mi basin are ephemeral. Groundwater sustains low flows only at Santa Cruz River near Nogales, Sonoita Creek near Patagonia, and Pantano Wash near Vail. Elsewhere, flow occurs only in direct response to precipitation. The median number of days per year in which there is no flow ranges from 4 at Sonoita Creek near Patagonia to 335 at Rillito Creek near Tucson. The streamflow is extremely variable from year to year, and annual flows have a coefficient of variation close to or exceeding unity at most stations. Most floods result from high-intensity precipitation caused by thunderstorms during the period July to September. Occasionally, when snowfall at the lower altitudes is followed by rain, winter floods produce large volumes of flow. (Woodard-USGS)
W71-06502

AVAILABILITY OF WATER IN THE MISSISSIPPI EMBAYMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W71-06520

STOCHASTIC SIMULATION OF MONTHLY STREAMFLOW BY A MULTIPLE REGRESSION MODEL UTILIZING PRECIPITATION DATA,
Nevada Univ., Reno.
Jochanan Bonne.
Nevada Center for Water Resources Research Report, Reno, July 1970. 48 p, 12 fig, 4 tab, 13 ref. OWRR Project B-024-NEV (1).

Descriptors: *Streamflow, *Model studies, *Stochastic processes, *Simulation analysis, *Regression analysis, Watersheds (Basins), Precipitation (Atmospheric), Mathematical models, Equations, Computers, Computer programs, Evaluation, Synthetic hydrology, Streamflow forecasting.
Identifiers: Stochastic models.

A model for simulation of monthly streamflow series was developed by a multiple regression approach which includes both precipitation and flow. The variables in the regression function represent the previous month's flow, current precipitation, as independent variables, while the dependent variable is the current streamflow. A procedure is suggested for generating precipitation data which can be used in the multiple regression. The frequency distribution of the flow record in each month is determined by statistical analysis. These monthly distributions are later imposed on the model in order to reproduce data with the same statistical parameters and distributions. For each month the optimal combination of variables for the regression model is selected according to least variance, largest coefficient of determination, and the results of significance tests for the regression coefficients. Three watersheds with different physiographic characteristics were selected. Streamflows were simulated for each basin and the results agreed with the historic records of statistical parameters and frequency distribution. (Woodard-USGS)
W71-06659

RANDOMLY FLUCTUATING FLOW IN A CHANNEL DUE TO RANDOMLY FLUCTUATING PRESSURE GRADIENTS,
National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center.
For primary bibliographic entry see Field 08B.
W71-06665

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1970,
Geological Survey, Helena, Mont.
M. V. Johnson, and R. J. Omang.
Geological Survey Report, March 1971. 139 p, 1 fig.

Descriptors: *Floods, *Small watersheds, *Streamflow, *Peak discharge, *Montana, Hydrologic data, Gaging stations, Stream gages, Precipitation (Atmospheric), Runoff, Flooding, Frequency analysis, Flood forecasting, Data collections, Discharge measurement, Flood control.

A program to investigate the magnitude and frequency of floods from small drainage areas in Montana was begun July 1, 1955. Originally 45 crest-stage gaging stations were established. The program was expanded to 138 gaging stations in 1959, and to 202 gaging stations in 1963. About 200 stations were in operation from 1963 to 1967, and 185 were in operation in 1968, 1969, and part of 1970. This is the sixteenth annual report prepared to inform the cooperators, and other interested parties, of the status of the program. The report is primarily a tabulation, by water year, of the annual peak stage and discharge at each crest-stage gaging station. Also, it summarizes the activities and progress made during the 1970 water year. The ultimate objective is to obtain enough information on the magnitude and frequency of floods in various sizes and types of drainage basins to help design adequate highway drainage structures throughout the state. (Woodard-USGS)
W71-06667

DRAINAGE AREA STATISTICS FOR THE CHESAPEAKE BAY FRESH-WATER DRAINAGE BASIN,
Johns Hopkins Univ., Baltimore, Md., Chesapeake Bay Inst.
R. C. Seitz.
Chesapeake Bay Institute Special Report 19, Reference 71-1, Johns Hopkins University, February 1971. 21 p, 1 map, 1 graph, 3 tab, 8 ref.

Descriptors: *Watersheds (Basins), *Streams, *Hydrologic data, *Bays, *Statistics, Gaging stations, Rivers, Tributaries, Runoff, Streamflow, Water yield.
Identifiers: *Drainage areas, *Chesapeake Bay inflow.

To sum the tributary inputs into Chesapeake Bay, the fresh-water drainage basin was divided up into 5-nautical mile long segment intervals beginning at the Bay entrance and river mouth locations and extending up to the limit of the tidal effects. Then additional segments, which were less than 5-nautical miles in length, were employed until either a dam or a gaging station was encountered, or until the entire drainage basin of the tributary head waters was defined. All areas in the tables are in square statute miles. The areas are set out in the tables according to rank. The main portion of the Chesapeake Bay is rank 1, a tributary entering the main Bay region is rank 2, etc. There are a total of 5 ranks. All accumulations are started anew with each rank. Fresh-water gaging stations are tabulated. Gaging stations which can be used for the segment under consideration are also given. Flow rates of drainage areas can be obtained at the gaging stations and then this factor can be applied to the segment involved to determine the fresh-water discharge for that drainage area. (Woodard-USGS)
W71-06668

APPRAISAL OF THE WATER AND RELATED LAND RESOURCES OF OKLAHOMA.
For primary bibliographic entry see Field 06B.
W71-06673

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-06674

THE INTERRELATIONSHIP BETWEEN WATER TEMPERATURE, BED CONFIGURATION, AND SEDIMENT CHARACTERISTICS IN THE MISSOURI RIVER,
Army Corps of Engineers, Omaha, Nebr.
For primary bibliographic entry see Field 02J.
W71-06681

EFFECTS OF URBAN DEVELOPMENT ON FLOODS IN NORTHERN VIRGINIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04C.
W71-06690

SUMMARY OF FLOODS IN THE UNITED STATES DURING 1965,
Geological Survey, Washington, D.C.
J. O. Rostvedt.
For sale by Superintendent of Documents, US Government Printing Office, Washington, DC 20402, 60 cents. Geological Survey Water-Supply Paper 1850-E, 1970. 110 p, 52 fig, 34 tab, 26 ref.

Descriptors: *Floods, *Flood damage, *Hydrologic data, *United States, *Rainfall-runoff relationships, Streamflow, Flow measurement, Data collections, Stream gages, Runoff, Peak discharge, Hydrographs, Flood plains, Reviews.
Identifiers: *Flood summary (USA 1965).

This report describes the most outstanding floods in the United States during 1965. The four most damaging floods during the year, by order of decreasing magnitude, were in the South Platte River basin, Colorado (June), the upper Mississippi River basin (March-May), the Arkansas River basin in Colorado, Kansas, and New Mexico (June), and northwestern Missouri (July). The floods in the South Platte River basin were the most damaging in the history of the area. Floods in two separate periods in the upper Mississippi River basin were the most devastating in the history of an area which comprises parts of Minnesota, Wisconsin, Iowa, Illinois, and Missouri. Flood discharges in the Arkansas River basin in Colorado, Kansas, and New Mexico were many times greater than previous maximum discharges. Torrential rains on the Missouri River tributaries caused outstanding floods in a large area extending from the Iowa-Missouri State line on the north to the Blackwater River basin on the south and to the Grand River basin on the east. In addition to these floods, 23 others of lesser magnitude are included in this annual summary. (Woodard-USGS)
W71-06693

WATER RESOURCES OF RACINE AND KENOSHA COUNTIES, SOUTHEASTERN WISCONSIN,
Geological Survey, Washington, D.C.
Richard D. Hutchinson.
For sale by SOD, US Government Printing Office, Washington, DC 20402, $1.25. Geological Survey Water-Supply Paper 1878, 1970. 63 p, 20 fig, 4 plate, 11 tab, 89 ref.

Descriptors: *Wisconsin, *Water resources, *Groundwater, *Aquifers, *Surface waters, Lake Michigan, Streams, Streamflow, Lakes, Water level fluctuations, Wetlands, Hydrologic budget, Water utilization, Groundwater recharge, Groundwater

movement, Floods, Water quality, Urbanization, Surveys, Water resources development.
Identifiers: Inland lakes, Groundwater discharge.

Urbanization and changes in regional development in Racine and Kenosha Counties are increasing the need for water-resources information useful for planning and management. Lake Michigan assures the urbanized area in the eastern part of the two counties of a nearly inexhaustible water supply. In 1967 the cities of Racine and Kenosha pumped 32.6 mgd (million gallons per day) from the lake. Discharge from Racine and Kenosha Counties into Lake Michigan is low and has little effect on the lake. The Root and Pike Rivers and a number of smaller streams contribute a mean flow of about 125 cfs (cubic feet per second) to the lake. Groundwater, approximately 5 cfs, enters the lake as discharge from springs or as seeps. Thirty-five of the 43 lakes in the area are the visible parts of the groundwater table, and their stages fluctuate with changes in groundwater levels. The rest of the lakes are perched above the groundwater table. The sandstone aquifer, a major artesian reservoir underlying all of Racine and Kenosha Counties, is used as a water supply for industries, institutions, and three communities. Pumpage for these uses was about 3.3 mgd in 1967. The Niagara Dolomite is the principal shallow aquifer in the area. In 1967 pumpage from this aquifer for small community, domestic, stock, irrigation, and industrial uses was about 6.8 mgd. A water budget indicates that, of the 32 inches of precipitation that the area annually receives, about 7 inches runs off, and about 25 inches returns to the air as evapotranspiration. (Josefson-USGS)
W71-06696

WATER WAVES GENERATED BY LANDSLIDES,
Asian Inst. of Tech., Bangkok (Thailand).
Edward Noda.
ASCE Proceedings, Journal of the Waterways, Harbors and Coastal Engineering Division, Vol 96, No WW 4, p 835-855, November 1970. 21 p, 12 fig, 2 tab, 9 ref, append. US Army Corps of Eng. Contract DACW-72-67-C-0002.

Descriptors: *Landslides, *Waves (Water), *Tsunamis, Earthquakes, Reservoir design, Coastal engineering, Shore protection, Model studies, Mathematical models, Hydraulic models.
Identifiers: Landslide effects (Water waves).

The problem of water waves generated by landslides was studied by considering two distinct types of landslide; vertical and horizontal. Vertical landslides were studied by assuming that the landslide is modeled by a two-dimensional box falling vertically. A horizontal landslide is one which enters and moves through the water horizontally and was modeled analytically by a two-dimensional wall which moves into the fluid domain. Theoretical solutions were obtained assuming that the geometric and dynamic parameters of the problem are known. Graphs are presented for motion with constant velocity. For the vertical landslide problem, experiments were performed to verify this theory and the results compare very favorably in the region where linearized theory is valid. An approximate method is developed to find the amplitude of the largest wave in the nonlinear region by utilizing the solutions obtained from linear theory for vertical landslides. This approximate method was applied to the Lituya Bay, Alaska landslide of July 9, 1958 in order to estimate the largest wave. (Knapp-USGS)
W71-06698

WATER TEMPERATURES OF CALIFORNIA STREAMS, NORTH COASTAL SUBREGION,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-06699

A REVIEW OF THE WORK OF THE JAROSLAV CERNI INSTITUTE FOR THE YEAR 1968,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
Branislav Kujundzic.
Available from NTIS as TT-69-5009/1, $3.00 in paper copy, $0.95 in microfiche. Transactions Institute for Development of Water Resources, 'Jaroslav Cerni,' Vol 14, No 45, p 45-69, 1969. 25 p.

Descriptors: *Research and development, *Water resources development, Sedimentation, Floods, Hydraulics, River training, Regulation, Dams, Hydrogeology, Water chemistry, Land use, Conservation, Open channel flow.
Identifiers: *Water resources research, *Yugoslavia.

The work of the Jaroslav Cerni Institute, Yugoslavia, 1968, is listed. Each entry consists of project name, cooperator, name of engineer in charge, nature of work, description of work, phase of work, results and publications. The subjects of studies include damsites, breakwaters, groundwater, delta projects, levees, flood damage, bridge sites, river regulation, sedimentation, dam failure, water conduits, arid-land hydrology, powerplants, salt balance, land improvement, open channel flow, stratified flow, structural engineering, economics, flood control, hydrogeology and waste disposal. (See also W71-06705 and W71-06706) (Knapp-USGS)
W71-06704

STREAMFLOW AND HYDROLOGIC REGIONS OF THE TRANSBAYKAL (Russian: Rechnoy Stok i Gidrologicheskiye Rayony Zabaykal'ya),
Institute of Geography of Siberia and the Far East, Irkutsk (USSR).
G. V. Bachurin.
In: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiri, 'Nauka', p 5-22, 1970. 18 p, 3 fig, 1 tab, 26 ref.

Descriptors: *Streamflow, *Hydrologic data, *Meteorological data, Runoff, Geomorphology, Precipitation (Atmospheric), Water balance, Water levels, Floods, Groundwater, Moisture content, Seasonal, Discharge (Water), Mathematical studies, Statistical methods.
Identifiers: *Transbaykal, Hydrologic regionalization.

Because of the great variety of natural conditions in the Transbaykal, average annual maximum and minimum runoff values for adjacent river basins vary widely. Regionalization is particularly important here for facilitating an objective determination of various river regimen indices, water balance and streamflow owing to poor hydrologic coverage of the area. A critical analysis of present plans for a hydrologic regionalization of the Transbaykal is accompanied by a number of fundamental premises for a geographic-hydrologic regionalization. A basic criterion for hydrologic regionalization is a river water regimen expressed quantitatively and qualitatively in annual distribution of runoff, character of high waters, floods, low waters and in maximum water levels and discharges. Analysis of these and other river hydrologic data and an area study of a number of physico-geographic factors, especially relief, have led to the separation of the Transbaykal into 18 hydrologic regions. The new hydrologic regionalization is supported by quantitative descriptions of streamflow that take into consideration average annual runoff, maximum runoff of spring high water and summer-fall floods, minimum runoff in summer and fall and during the winter low-water period. (See also W71-06707) (Josefson-USGS)
W71-06713

NORTH RACCOON RIVER FLOOD PLAIN INFORMATION, SAC COUNTY, IOWA.
Corps of Engineers, Rock Island, Ill.
For primary bibliographic entry see Field 04A.
W71-06721

CEDAR RIVER FLOOD PLAIN INFORMATION, BLACK HAWK COUNTY, IOWA.
Corps of Engineers, Rock Island, Ill.
For primary bibliographic entry see Field 04A.
W71-06722

RUNOFF FROM COMBINED RURAL AND URBAN AREAS,
For primary bibliographic entry see Field 05G.
W71-06774

HYDROLOGY ANNUAL NO 14 - 1966.
For primary bibliographic entry see Field 07C.
W71-06962

EFFECT OF A COMMERCIAL CLEAR-CUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
For primary bibliographic entry see Field 04C.
W71-06970

TIDES OFF-SHORE: TRANSITION FROM CALIFORNIA COASTAL TO DEEP-SEA WATERS,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics; and Scripps Institution of Oceanography, La Jolla, Calif.
Walter Munk, Frank Snodgrass, and Mark Wimbush.
Available from National Technical Information Service as AD-716 130, $3.00 in paper copy, $0.95 in microfiche. Geophysical Fluid Dynamics, Vol 1, p 161-235, 1970. 75 p, 21 fig, 2 tab, 43 ref, 2 append. ONR Contract Nonr-2216 (12), Project No 083-502/8-25-69.

Descriptors: *Tides, *California, *Water level fluctuations, *Mathematical models, *Currents (Water), Water circulation, Coasts, Data collections, Data processing, Waves (Water), Ocean currents.
Identifiers: *Tidal currents.

Tidal pressures and currents were measured with self-contained capsules dropped to the sea floor for one month at distances of 175,190, and 500 nautical miles from San Diego. These observations, together with a one-week bottom pressure record at intermediary distances, were analyzed for tidal components by cross-correlation with a noise-free reference time series. Tidal currents turn counterclockwise, and are polarized with maximum flow parallel to shore in the direction of tidal propagation at local high tide. The current amplitude is roughly 2 cm/sec for the semidiurnal component, 1 cm/sec for the diurnal component. To interpret these diverse observations, the dispersion laws were modeled for all possible rotationally-gravitationally trapped waves against a straight coast with shelf. The mathematical model can account for the main features of the observed tidal heights, and gives relative amplitudes at the coast. Tidal currents are not well fitted by the model, and there are problems associated with the separation of barotropic and baroclinic modes, and with the benthic boundary layer. Coastal energy dissipation is small in the sea under investigation, but a 'capacitive' phase delay appears to be associated with Northern California harbors and inland waters. (Knapp-USGS)
W71-07043

2F. Groundwater

ON THE SOLUTION OF TRANSIENT FREE-SURFACE FLOW PROBLEMS IN POROUS MEDIA BY FINITE-DIFFERENCE METHODS,
Oslo Univ. (Norway). Inst. of Geophysics.
Marius Todsen.
Journal of Hydrology, Vol 12, No 3, p 177-210, February 1971. 34 p, 18 fig, 22 ref, 2 append.

Descriptors: *Groundwater movement, *Numerical analysis, *Drainage systems, *Mathematical studies, Theoretical analysis, Computers, Darcys law, Computer programs, Flow, Porous media, Hydraulic conductivity.
Identifiers: *Finite difference method.

Numerical solutions are obtained for a few initial-boundary-value problems in free-surface, saturated liquid flow through porous media. The exact differential equations governing the problems are approximated by finite-difference equations, and the resulting system of algebraic equations is solved by using an automatic digital computer. Only two-dimensional, homogeneous and isotropic flow models - including infiltration - are dealt with, but in principle there is little difficulty in extending the models to nonhomogeneous and anisotropic media. Though also possible in principle, an extension to three dimensions demands a drastic increase in the necessary storage space of the computer. The question of computational stability of the difference schemes adopted is considered. Good agreement with some results of other calculations is found for the two distinct models, one ditch drainage and one earth dam model. (Knapp-USGS)
W71-06471

GROUNDWATER FLOW IN HETEROGENEOUS, ANISOTROPIC FRACTURED MEDIA: A SIMPLE TWO-DIMENSIONAL ELECTRIC ANALOG,
Centre d'Hydrogeologie, Neuchatel, Switzerland. Geological Institute.
L. Kiraly.
Journal of Hydrology, Vol 12, No 3, p 255-261, February 1971. 7 p, 3 fig, 8 ref.

Descriptors: *Analog models, *Groundwater movement, *Anisotropy, *Fractures (Geology), *Aquifer characteristics, Permeability, Transmissivity, Model studies, Simulation analysis, Analog computers, Water levels.
Identifiers: *Permeability tensor.

If two sets of fractures are orthogonal, the principal directions of the permeability tensor are always parallel to the normals of the two sets. Consequently, any desired orientation of the principal directions can be obtained by simple rotation of the two mutually orthogonal sets of fractures. Any permeability tensor can be simulated by two mutually orthogonal sets of fractures (or by three mutually orthogonal sets, in a three-dimensional space). Simulation of a heterogeneous, anisotropic permeability field may be accomplished by dividing the groundwater basin into regions with different permeability tensors. Each fracture geometry can be simulated by a very simple electric analog using conducting stripes painted on nonconducting paper. Consequently groundwater flow can be simulated in a heterogeneous, anisotropic permeability field by the means of a very simple electric analog. This electric analog permits study of the effect of irregularly developed and irregularly connected fractures on the potential field, on the permeability field, and on the folow systems. (Knapp-USGS)
W71-06475

WATER RESOURCES OF SPARTANBURG COUNTY, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 02E.
W71-06487

GROUNDWATER ASPECTS OF THE LOWER HENRYS FORK REGION, EASTERN IDAHO,
Geological Survey, Washington, D.C.
E. G. Crosthwaite, M. J. Mundorff, and E. H. Walker.
Available from SOD, Washington, DC 20402 - $0.70. Geological Survey Water-Supply Paper 1879-C, 1970. 22 p, 6 fig, 1 plate, 18 ref.

Descriptors: *Groundwater, *Withdrawal, *Water resources development, *Hydrogeology, *Idaho, Water wells, Aquifers, Aquifer characteristics, Water yield, Drawdown, Geology, Water utilization, Water table, Water levels, Streams, Surface-groundwater relationships, Alluvium, Basalts, Water level fluctuations.
Identifiers: *Groundwater hydrology, *Henrys Fork region (Idaho), Volcanic rocks.

The lower Henrys Fork region in eastern Idaho includes the plains and low benches between Ashton and the junction of Henrys Fork and Snake River. The northwestern and western parts of the area are part of the Snake River basalt plain. The central part of the area is occupied by alluvial plains of the Snake, Teton, and Falls Rivers and of Henrys Fork. The alluvial deposits are underlain by basalt. The southeastern part of the area is a bench (Rexburg Bench), chiefly on silicic and basaltic volcanic rocks, which rises gradually to mountain peaks (Big Hole Mountains) southeast of the area. Total withdrawals of groundwater for irrigation in 1962, principally in the Rexburg Bench, were estimated to be 25,000 acre-feet. About 10,000 acre-feet was withdrawn for domestic, municipal, and stock supplies. These withdrawals caused no significant decline in the water table. In the Ashton area, surface-water irrigation has caused water to be perched in basalt above the silicic volcanic rocks, and much of this perched water contributes to streamflow. Some groundwater can be pumped from the basalt for irrigation and other uses. If groundwater were pumped for irrigation, the flow of Henrys Fork would be decreased by the amount of pumped water consumed by crops. Groundwater prospects for irrigation in the Falls River area are not encouraging. (Woodard-USGS)
W71-06490

GEOLOGY AND WATER RESOURCES OF CLAY COUNTY, SOUTH DAKOTA, PART III - BASIC DATA,
South Dakota Geological Survey, Vermillion; and Geological Survey, Washington, D.C.
Cleo M. Christensen, and Jerry C. Stephens.
South Dakota Geological Survey Bulletin 19, 1970. 107 p, 3 fig, 3 tab.

Descriptors: *Water resources, *Groundwater, *Geology, *South Dakota, *Hydrologic data, Data collections, Water wells, Drill holes, Water yield, Water quality, Aquifers, Aquifer characteristics, Water level, Water table, Springs, Hydrogeology, Logging (Recording), Chemical analysis, Pumping, Specific capacity.
Identifiers: *Well data, *Test holes.

This report is a compilation of basic data gathered during a geological and hydrological investigation of groundwater in Clay County, South Dakota in 1963 and 1964. Purpose of the report is twofold: (1) to make basic geologic and hydrologic data available for future planning and study, and (2) as a supplement to related reports already published. The data include logs of wells and test holes, chemical analyses of water from selected wells, records for springs, and maps showing locations of investigations. Each well record also includes owner or use, year completed, depth of well, casing diameter, land-surface altitude, principal aquifer, type of pump, use, water level, date of measurement or visit, specific conductance of water, hardness, and remarks. (Woodard-USGS)
W71-06501

GEOHYDROLOGY OF THE SHALLOW AQUIFERS OF BATON ROUGE, LOUISIANA,
Louisiana State Univ., Baton Rouge. Water Resources Research Inst.
Charles G. Smith, Jr.
Louisiana Water Resources Research Institute Bulletin GT-4, Louisiana State University, October 1969. 31 p, 14 fig, 1 tab, 19 ref. OWRR Projects A-004-LA (4) and B-002-LA (2).

Descriptors: *Hydrogeology, *Aquifers, *Groundwater, *Saline water intrusion, *Louisiana, Water pollution sources, Aquifer characteristics, Pumping, Water yield, Water quality, Hydrologic data, Hydrology, Water wells, Chemical analysis, Chlorides, Industrial water, Drawdown, Groundwater recharge.
Identifiers: *Baton Rouge (La).

The geohydrology of the 10 major aquifers in the Baton Rouge, Louisiana area was studied in order to determine the threat of salt-water intrusion to industrial water supplies. The '400-ft' and '600-ft' sands furnish 22% of the annual groundwater withdrawal from the aquifers. Salt water has been advancing northward toward the industrial center in the '600-ft' sand as a result of hydraulic gradients created by industrial groundwater pumpage. Three miles south of this area, the Baton Rouge fault obstructs the flow of water from the south side of the fault. Apparently the salt water intruding the industrial wells was trapped in the '600-ft' sand north of the fault and an unknown distance west of the Mississippi River. The '400-600 ft' aquifer complex was not affected to any extent by the Denham Springs fault immediately north of the city. Local pinchouts of the two aquifers obstruct flow north and southwest of the industrial area. The Mississippi River indirectly replenishes the '400-600 ft' complex west of the river through the 'University Sand.' Removal of the salt water north of the fault will result in natural replenishment with fresh water. (Woodard-USGS)
W71-06505

METHODS AND APPLICATIONS OF ELECTRICAL SIMULATION IN GROUNDWATER STUDIES IN THE LOWER ARKANSAS AND VERDIGRIS RIVER VALLEYS, ARKANSAS AND OKLAHOMA,
Geological Survey, Washington, D.C.
M. S. Bedinger, J. E. Reed, C. J. Wells, and B. F. Swafford.
Available from SOD, Washington, DC 20402, $1.00. Geological Survey, Water-Supply Paper 1971, 1970. 71 p, 36 fig, 4 plate, 3 tab, 27 ref.

Descriptors: *Analog models, *Surface-groundwater relationship, *Alluvial aquifers, *Arkansas, *Oklahoma, Groundwater, Rivers, Valleys, River training, Hydrogeology, Water levels, Pumping, Water level fluctuations, Model studies, Methodology, Reservoirs, Streamflow, Aquifer characteristics, Evaluation.
Identifiers: *Arkansas River Valley, *Verdigris River Valley.

The Arkansas River Multiple-Purpose Plan will provide year-round navigation on the Arkansas River from near its mouth to Muskogee, Okla., and on the Verdigris River from Muskogee to Catoosa, Okla. The altered regimen in the Arkansas and Verdigris Rivers will affect groundwater conditions in the adjacent alluvial aquifers. Analysis and projections of groundwater conditions were made by use of electrical analog models. These models use the analogy between the flow of electricity in a resistance-capacitance circuit an the flow of a liquid in a porous and permeable medium. A test of the validity of the analog to perform as the aquifer would, within the range of historic forces was verified. The verification process consisted of simulating the action of historic forces which had acted upon the aquifer and of duplicating the aquifer response with the analog. Dams on the Arkansas and Verdigris Rivers will impose a direct change in water levels in the aquifers adjacent to the rivers. This change will be attenuated by the resultant change in accretion to the aquifer. The analogs of aquifers in the valleys were used to determine the change in groundwater level from preconstruction to postconstruction conditions. (Woodard-USGS)
W71-06507

POTENTIAL DEVELOPMENT AND RECHARGE OF GROUNDWATER IN MILL CREEK VALLEY, BUTLER AND HAMILTON COUNTIES, OHIO, BASED ON ANALOG MODEL ANALYSIS,
Geological Survey, Washington, D.C.
Richard E. Fidler.

Available from SOD, Washington DC 20402, $1.00. Geological Survey Water-Supply Paper 1893, 1970. 37 p, 12 fig, 4 plate, 2 tab, 14 ref.

Descriptors: *Withdrawal, *Water level fluctuations, *Drawdown, *Groundwater recharge, *Analog models, Ohio, Hydrogeology, Water wells, Aquifers, Aquifer characteristics, Precipitation (Atmospheric), Water utilization, Artificial recharge, Water yield, Water table, Water levels, Model studies, Water resources development, Water supply.
Identifiers: *Groundwater development.

Mill Creek valley is part of the greater Cincinnati industrial area in southwestern Ohio. In 1964, nearly 30 percent of the water supply in the study area of about 27 square miles was obtained from wells in the glacial-outwash aquifer underlying the valley. Groundwater demand has increased steadily since the late 1800's, and excessive pumpage during the years of World War II caused water levels to decline to critical levels. Natural recharge to the aquifer, from precipitation, is about 8.5 mgd. In 1964, the total water use was about 30 mgd, of which 8.1 mgd was obtained from wells in Mill Creek valley, and the remainder was imported from outside the basin. By the year 2000 groundwater pumpage is expected to exceed 25 mgd. Three hypothetical pumping plans were developed by projecting past pumpage data to the years 1980 and 2000. Various combinations of injection wells were tested on the model under different hypothetical conditions of pumpage. Based on analog model analysis, from three to eight injection wells, with an approximate input of 2 mgd each, would reverse the trend in declining groundwater levels and provide adequate water to meet anticipated demands. (Woodard-USGS)
W71-06509

HYDROLOGY OF LIMESTONE TERRANES - GEOLOGIC INVESTIGATIONS,
Geological Survey of Alabama, University.
John L. Sonderegger, and James C. Kelley.
Available from the National Technical Information Service as PB-198 277, $3.00 in paper copy, $0.95 in microfiche. Alabama Geological Survey Bulletin 94, Part B, 1970. 146 p, 19 fig, 6 plate, 2 tab, 44 ref, 4 append. OWRR Project B-007-ALA (3).

Descriptors: *Hydrogeology, *Karst, *Alabama, Limestones, Groundwater movement, Geology, Mapping, Maps, Geologic investigations, Geologic mapping, Geological surveys, Structural geology.
Identifiers: Athens (Ala).

Limestone hydrology was studied in the Athens and Elkmont 7 1/2-minute quadrangles, an area of about 117 square miles in north-central Limestone County near the center of the northernmost tier of counties in Alabama. Solution activity is shown to be the major factor causing 'deformation' structures in the northern Highland Rim section of the area. Tectonic structure has been modified by groundwater solution. Basic data in the form of measured geologic sections, and well cutting descriptions are provided. In addition, location orientation and number of joints measured in the area are shown on the geologic and contour maps. (Knapp-USGS)
W71-06518

GEOHYDROLOGIC SIGNIFICANCE OF LITHOFACIES OF THE COCKFIELD FORMATION OF LOUISIANA AND MISSISSIPPI AND OF THE YEGUA FORMATION OF TEXAS,
Geological Survey, Washington, D.C.
J. N. Payne.
Available from Superintendent of Documents, Washington, D.C. 20402 - $6.25 (including plates in separate case). Geological Survey Professional Paper 569-B, 1970. 14 p, 2 fig, 8 plate, 1 tab, 63 ref. (Plates under separate cover).

Descriptors: *Hydrogeology, *Gulf Coastal Plain, *Mississippi River basin, *Sandstones, *Aquifers, Louisiana, Mississippi, Texas, Permeability, Groundwater movement, Water quality, Water yield, Stratigraphy, Structural geology, Hydraulics, Sedimentation, Subsurface investigations, Borehole geophysics, Electrical well logging.
Identifiers: Aquifer testing, Pumping tests, Cockfield Formation, Yegua Formation.

Sand-percentage and maximum sand-unit thickness maps show that the Cockfield and Yegua Formations in Louisiana, Mississippi, and eastern Texas consists of sediments deposited in a deltaic-fluvial-lain environment. An interlacing channel system was well developed in the area during Cockfield and Yegua time that is thought to be the record of the ancestral Mississippi and Trinity River systems. Sand percentage and maximum sand-unit thickness suggest that an alongshore and nearshore environment of deposition was predominant. The coefficient of permeability increases with increase in thickness of the sand body. As a consequence of this relation between permeability and thickness, the areas of greater transmissibility are found along channel paths where thick sand units were deposited. The direction of flow of water is toward the gulf coast geosyncline and the Mississippi River alluvial valley, the two principal areas of discharge. The water in and near outcrops contains appreciable amounts of calcium and magnesium. Differences in lithologic distribution and of altitude of the piezometric surfaces are vividly reflected in the regional distribution of the dissolved-solids content of waters. (Knapp-USGS)
W71-06519

AVAILABILITY OF WATER IN THE MISSISSIPPI EMBAYMENT,
Geological Survey, Washington, D.C.
E. M. Cushing, E. H. Boswell, P. R. Speer, and R. L. Hosman.
Available from Superintendent of Documents, Washington, D.C. 20402 - $5.50 (paper cover). Geological Survey Professional Paper 448-A, 1970. 13 p, 7 fig, 7 plate, 3 tab, 86 ref. (Plates published under separate cover.)

Descriptors: *Runoff, *Gulf Coastal Plain, *Groundwater, *Aquifers, *Mississippi River basin, Water resources development, Streamflow, Water yield, Water supply, Transmissivity, Stratigraphy, Climates, Precipitation (Atmospheric), Surface waters, Water levels, Water quality.
Identifiers: *Mississippi embayment, *Water availability.

Most of the Mississippi embayment region is underlain by aquifers that will yield large quantities of water to wells, so that groundwater is the most readily available source of fresh water. Groundwater having a dissolved-solids content of less than 500 ppm is generally available at depths of less than 1,000 feet, and water having a dissolved-solids content of less than 1,000 ppm is available in some places to depths of more than 2,000 feet. Iron is the most common troublesome chemical constituent in the groundwater. The potential yield of the aquifers that underlie the region is estimated to be about 30,000 mgd, of which about 3,000 mgd is presently being withdrawn. Water in varying amounts is also available from streams within the region. The amount of water which originates within the region and which leaves it as streamflow during a year averages about 80,000 mgd. An additional 360,000 mgd leaves the region as streamflow during an average year, this amount having originated outside the region. The 1965 withdrawals from streams within the region were about 1,700 mgd. (Knapp-USGS)
W71-06520

THE DETECTION OF MAGNETIC FIELDS CAUSED BY GROUNDWATER AND THE CORRELATION OF SUCH FIELDS WITH WATER DOWSING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 07B.
W71-06655

APPRAISAL OF THE WATER AND RELATED LAND RESOURCES OF OKLAHOMA.
For primary bibliographic entry see Field 06B.
W71-06673

COMBINED KARST AND WATER RESEARCH IN THE DANUBE RIVER SEEPAGE REGION (BADENWURTTEMBERG) IN THE YEARS 1967-1969 (GERMAN),
H. Batsche, F. Bauer, H. Behrens, K. Buchtela, and H. J. Dombrowski.
Steirische Beitrage zur Hydrogeologie, Graz, 1970. 165 p, 72 fig, 5 plate, 15 tab, 87 ref.

Descriptors: *Groundwater movement, *Surface-groundwater relationships, *Tracers, *Karst, Methodology, Geomorphology, Drainage effects, Sinks, Carbonate rocks, Hydrogeology, Rivers, Leakage, Water loss, River beds.
Identifiers: *Danube River (Southwestern Germany).

After two years of preparatory work (hydrogeological detailed mapping and investigation of the contents of environmental isotopes of the waters) a large-scale combined tracing experiment was carried out in the area of the upper Danube (Baden-Wurttemberg, Southwestern Germany) in autumn 1969. In this area the Danube crosses the Jurassic limestone of the Schwabische Alb and loses water into the karstic carbonate rocks. The labelling materials injected in various sinkholes were: 1000 kg KCl, 105 l Dipenten, 8 kg Sulphorhodamine G extra, 250 kg Ammonbromide, 4 l Chrome-51, 20 kg Lanthaninstrate, 400 kg detergents, 75 kg Isobornylacetate, 50 kg sodium-fluorescine, Serratia marcenses, 50 t sodium chloride, and 28 kg brown and green dyed Lycopodium spores. The cooperative experiment of institutions of Austria, Germany and Yugoslavia showed, besides the successful trying out of new labelling materials, that the Danube waters reappear in the Aach waters, and influence the groundwater conditions in the entire area between Engen, Beuren and Eigeltingen, even in places where the Jurassic limestones dip below the tertiary sediments (marl and sandstone) towards the South. (Woodard-USGS)
W71-06692

GEOLOGIC AND HYDROLOGIC FACTORS BEARING ON SUBSURFACE STORAGE OF LIQUID WASTES IN MARYLAND,
Geological Survey, Parkville, Md.
For primary bibliographic entry see Field 05E.
W71-06695

WATER RESOURCES OF RACINE AND KENOSHA COUNTIES, SOUTHEASTERN WISCONSIN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W71-06696

FINITE ELEMENT SOLUTION OF STEADY STATE POTENTIAL FLOW PROBLEMS--THE HYDROLOGIC ENGINEERING CENTER GENERALIZED COMPUTER PROGRAM 723-G2-L2440.
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 07C.
W71-06701

A REVIEW OF THE WORK OF THE JAROSLAV CERNI INSTITUTE FOR THE YEAR 1968,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 02E.
W71-06704

RECHARGE OF AQUIFERS IN ARID ZONES AND EFFECTIVE POROSITY COEFFICIENT,
For primary bibliographic entry see Field 04B.
W71-06705

GEOHYDROLOGIC INVESTIGATIONS IN THE MESILLA VALLEY, NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
Andrew M. Taylor.
M Sc Thesis, New Mexico State University, September 1967. 130 p, 5 fig, 1 tab, 24 ref, 8 append. OWRR Project A-008-N MEX (2).

Descriptors: *Groundwater, *Hydrogeology, *Hydrologic data, *New Mexico, Water resources, Geology, Aquifers, Aquifer characteristics, Water sources, Water yield, Water levels, Specific capacity, Water wells, Water quality, Withdrawal, Recharge, Glacial drift, Drawdown, Mathematical model, Evaluation, Water utilization, Hydrographs.
Identifiers: *Mesilla Valley (New Mex).

Well logs, gravity data and static water levels are analyzed to develop a generalized concept of groundwater aquifers of the Mesilla Valley and adjacent areas, New Mexico. The primary source of recharge to the Mesilla Valley aquifer is from excess water applied to the farmlands. During periods of normal surface-water supply, an amount of water approximately equal to the annual recharge is discharged by seepage to a network of drains located throughout the valley. The mean of the normal drain return flow therefore appears to be an approximation of the normal annual recharge. Specific capacities of 23.1 gpm/ft and 8.8 gpm/ft are obtained for Southern Pacific Railroad Company for Lizard Well No. 1 and New Mexico State University Well No. 8, respectively. A safe annual withdrawal of 105,208 acre-feet/year is predicted by estimation of withdrawals from agricultural records versus the corresponding drawdowns of water levels in the aquifer. A formula to predict drawdown from withdrawals of groundwater from the aquifer of the Mesilla Valley was evaluated. The correlation between the mathematical model and observed groundwater changes tested for the drought of 1951 to 1958 is reasonable. (See also W70-04399) (Woodard-USGS)
W71-06729

GROUNDWATER AND WELLS.
University Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 04B.
W71-06920

GEOPHYSICS AS AN AID TO THE SMALL WATER WELL CONTRACTOR,
Lansing Board of Water and Light, Mich.
For primary bibliographic entry see Field 04B.
W71-06946

GROUNDWATER IN THE ADEN SECTOR OF SOUTHERN ARABIA,
Geological Survey, Arlington, Va.
D. J. Cederstrom.
Groundwater, Vol 9, No 2, p 29-34, March-April 1971. 6 p, 2 fig, 10 ref.

Descriptors: *Water resources development, *Water wells, *Deserts, Water supply, Groundwater, Recharge, Water balance, Alluvium, Aquifers, Water table, Hydrogeology.
Identifiers: *Aden, *Arabia.

A reconnaissance of parts of the former West Aden Protectorate, Arabia, enables a characterization of the dominant hydrologic elements. In this desert environment, intermittent streams from the east-west range of mountains provide considerable water for flood irrigation and groundwater recharge of alluvial fans along the Gulf of Aden. High yield wells are developed in the coastal area and in alluvial areas on the back slope facing the Empty Quarter. Groundwater in the interior is generally restricted to areas where wadi flow provides occasional recharge. Relatively few rock wells have been drilled in the area. Many wells in the alluvium yield silty water leading to clogging of the wells and undue pump wear. (Knapp-USGS)
W71-07003

FUTURE DEMANDS ON GROUNDWATER IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 06D.
W71-07004

ON THE MANAGEMENT OF GROUNDWATER IN COASTAL AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W71-07005

A SHORTCUT FOR COMPUTING STREAM DEPLETION BY WELLS USING ANALOG OR DIGITAL MODELS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W71-07006

GROUNDWATER FLUCTUATIONS IN RESPONSE TO ARBITRARY PUMPAGE,
Illinois State Water Survey, Urbana.
Allen Moench.
Groundwater, Vol 9, No 2, p 4-8, March-April 1971. 5 p, 6 fig, 10 ref.

Descriptors: *Water level fluctuations, *Unsteady flow, *Groundwater movement, *Withdrawal, *Computer programs, Water table, Aquifers, Drawdown, Hydrogeology, Mathematical studies, Confined water, Artesian wells, Mathematical models, Theis equation, Analog models, Illinois, Simulation analysis.
Identifiers: Artesian aquifers.

The problem of predicting water level changes in an aquifer due to variable pumpage is approached by using the convolution integral. Equations are given for a nonleaky artesian aquifer and a leaky artesian aquifer with negligible storage in the confining layer. Computational results compare favorably with type curves for hypothetical cases with constant pumping. A practical example using variable pumpage from pumping centers shows the applicability of the technique and its value in interpreting water level variations. (Knapp-USGS)
W71-07007

HYDROTHERMAL EXPLOSION CRATERS IN YELLOWSTONE NATIONAL PARK,
Geological Survey, Menlo Park, Calif.
L. J. P. Muffler, D. E. White, and A. H. Truesdell.
Geological Society of America Bulletin, Vol 82, No 3, p 723-740, March 1971. 18 p, 10 fig, 38 ref.

Descriptors: *Craters, *Explosions, *Thermal water, *Steam, National parks, Wyoming, Thermal springs, Subsurface waters, Geothermal studies, Groundwater movement, Surface-groundwater relationships.
Identifiers: *Hydrothermal explosions, *Steam explosions, Yellowstone National Park.

Hydrothermal explosions are produced when water contained in near-surface rock at temperatures as high as perhaps 250 deg C flashes to steam and violently disrupts the confining rock. These explosions are due to the same instability and chain reaction mechanism as geyser eruptions but are so violent that a large proportion of solid debris is expelled along with water and stream. At least ten hydrothermal explosion craters, ranging in diameter from a few tens of feet to about 5000 ft, are in Yellowstone National Park. Eight of these craters are in hydrothermally cemented glacial deposits; two are in Pleistocene ash-flow tuff. Each is surrounded by a rim composed of debris derived from the crater. Geologic relations at the Pocket Basin crater establish that the explosion there took place during the waning stages of early Pinedale Glaciation. An ice-dammed lake may have existed over a hydrothermal system at the Pocket Basin site; the hydrothermal explosion was triggered by the abrupt decrease in confining pressure consequent in sudden draining of the lake. Most of the other explosion craters in Yellowstone Park could have been triggered in the same manner. (Knapp-USGS)
W71-07008

NOTE ON HYDROLOGICAL RESEARCH IN BOTSWANA WITH SPECIAL EMPHASIS ON RESEARCH IN THE HYDROGEOLOGICAL FIELD,
Botswana Geological Survey, Lobatsi.
C. M. H. Jennings.
South Africa Journal of Science, Vol 67, No 1, p 12-21, January 1971. 10 p, 13 ref.

Descriptors: *Surveys, *Hydrogeology, *Water resources development, Aquifers, Borehole geophysics, Water wells, Aquifer characteristics, Transmissivity, Storage coefficient, Safe yield, Infiltration, Water balance, Radioactive dating, Reviews, Foreign research.
Identifiers: *Botswana.

Climatically Botswana is a semi-arid country with a variable and uncertain rainfall. Some rivers in northwestern Botswana are perennial, but all other rivers are ephemeral in nature. Emphasis has been placed for many years on the development and utilization of underground water resources. As a result a considerable body of hydrogeological data has been built up. Research work is also being carried out and this has included the establishment of observation boreholes in selected areas, where by taking daily, weekly or monthly water rest level measurements related to statistics of underground water use and rainfall data, information is being compiled which will lead eventually to determinations on transmissibility, storage capacity, safe yields and infiltration rates for certain important aquifers. As an adjunct to this work systematic chemical analyses and temperature measurements of all groundwaters are carried out. Carbon-14 and tritium dating of groundwaters is in progress. Additional information is being obtained or is planned from resistivity and spontaneous-potential logging of boreholes. (Knapp-USGS)
W71-07026

WELLS AND SPRINGS IN CALIFORNIA AND NEVADA WITHIN 100 MILES OF THE POINT 37 DEGREE 15' N., 116 DEGREE 25'W., ON NEVADA TEST SITE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-07029

USE OF GROUNDWATER FOR IRRIGATION IN HAMILTON AND YORK COUNTIES, NEBRASKA,
Geological Survey, Lincoln, Nebr.
Eugene K. Steele, Jr.
Nebraska Water Survey Paper No 27, February 1971. 43 p, 18 fig, 4 tab, 13 ref.

Descriptors: *Groundwater, *Water wells, *Irrigation, *Water level fluctuations, *Nebraska, Withdrawal, Drawdown, Hydrographs, Aquifers, Water yield, Precipitation (Atmospheric), Pumping, Discharge measurement, Hydrologic data, Data collections.
Identifiers: Hamilton and York Counties (Nebr).

About 317,000 acres, or 45 percent of the land in Hamilton and York Counties, Nebraska, is irrigated with water pumped from wells. Beginning in 1961, a downward trend of water levels in wells indicated that the groundwater supply was being depleted progressively in a large part of the two counties. Comparison of water levels in the spring of 1970 with estimated water levels prior to irrigation development indicates a net decrease of nearly 1 million acre-feet in the stored supply. Withdrawal during the 1969 irrigation season (about 400,000 acre-feet) apparently did not contribute significantly to the long-term net decrease; the weighted water-level change (1969 to 1970) corresponded to only a very small change in storage. Hydrographs of water-level changes since 1958 in 10 wells in-

dicate that 1969 pumpage was much less than pumpage in the years 1963-67, when the downward trend of water levels was the steepest. (Woodard-USGS)
W71-07031

SEASONAL VARIATIONS, SULPHUR MOUNTAIN HOT SPRINGS, BANFF, ALBERTA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
R. O. Van Everdingen.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch Technical Bulletin No 33, 1970. 11 p, 5 fig, 2 tab, 3 ref.

Descriptors: *Water chemistry, *Spring waters, *Hot springs, *Hydrologic data, *Water properties, Fluctuation, Seasonal, Water temperature, Flow, Chemical properties, Chemical analysis, Dissolved solids, Dissolved oxygen, Data collections, Geochemistry, Thermal water, Mineral water, Thermal springs, Hydrogen sulfide.
Identifiers: *Hot Springs (Banff, Alberta), Canada.

Seasonal variations in the physical and chemical parameters of the sulfurous hot springs on Sulphur Mountain near Banff, Alberta, occur between late April and early August as a result of the influx of varying quantities of water having temperatures and dissolved-solids concentrations lower than the sulfurous thermal water. In the absence of accurate discharge measurements, only a 'minimum required' mixing ratio could be calculated, leading to minimum ion concentrations and a minimum temperature for the cooler water. The Kidney Spring just below the Upper Hot Spring, and the Cave Spring behind the Cave-and-Basin Aquacourt were selected as subjects for this program because of their accessibility and the limited amount of human interference with their free flow. The variations in water temperatures and dissolved-solids concentrations for the Kidney Spring and the Cave Spring are shown. The graphical representation of the chemical analyses for the Kidney Spring shows that the low-temperature period is characterized by a decrease in the concentrations of all dissolved components except alkalinity. (Woodard-USGS)
W71-07036

PUMPAGE AND GROUNDWATER STORAGE DEPLETION IN CUYAMA VALLEY, CALIFORNIA, 1947-66,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 04B.
W71-07039

WATER WELL EXPLOSIONS: AN ENVIRONMENTAL HAZARD,
Pennsylvania State Univ., University Park. Coll. of Earth and Mineral Sciences.
For primary bibliographic entry see Field 04B.
W71-07040

A TIME SERIES FROM THE BEACH ENVIRONMENT - II,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 02J.
W71-07047

GEOLOGY AND WATER RESOURCES OF CAMPBELL COUNTY, SOUTH DAKOTA--PART II: WATER RESOURCES,
Geological Survey, Huron, S. Dak.
Neil C. Koch.
South Dakota Geological Survey Bulletin 20, 1970. 38 p, 18 fig, 5 tab, 17 ref.

Descriptors: *Groundwater, *Hydrogeology, *Hydrologic data, *Water resources development, *South Dakota, Aquifers, Aquifer characteristics, Glacial drift, Water sources, Water yield, Water levels, Specific capacity, Water wells, Water quality, Withdrawal, Consumptive use, Irrigation, Domestic water, Recharge, Surface-groundwater relationships, Hydrographs.
Identifiers: *Campbell County (S. Dak.).

Campbell County, an area of 763 square miles, is in the north-central part of South Dakota, is bounded on the west by the Missouri River and on the north by North Dakota. The county is nearly covered by glacial drift and lake deposits of Pleistocene age, and alluvium and colluvium of Holocene age. These sediments range in thickness from a thin veneer to more than 475 feet and overlie the Pierre Shale and Fox Hills Formations of Cretaceous age. A deep-glacial aquifer, composed mostly of outwash, underlies about 20 percent of the county, averages 100 feet in thickness, and contains about 2 1/2 million acre-feet of water in transient storage. This aquifer supplies about 11 percent of the water used in the county. Shallow-glacial aquifers cover 40 percent of the county and yield as much as 500 gpm to wells. There is about 1 million acre-feet of water in transient storage. Shallow aquifer water is more suitable for irrigation than deep aquifer water. Both aquifers contain water that is high in bicarbonate and sulfate. The shallow-glacial water is generally high in calcium, whereas the deep-glacial water is always high in sodium. The artesian Dakota and Fall River aquifers underlie all of Campbell County at a depth of about 2,000 feet. These aquifers furnish water of sufficient quantity for domestic and farm needs by flowing wells. Because of excessive mineralization this water is not suitable for irrigation. (Woodard-USGS)
W71-07048

2G. Water in Soils

INORGANIC PHOSPHATE TRANSFORMATION IN WATERLOGGED SOILS,
Louisianna State Univ., New Orleans.
For primary bibliographic entry see Field 05B.
W71-06512

MOVEMENT OF 2,4-D IN SOILS,
New Mexico Agricultural Experiment Station, University Park.
For primary bibliographic entry see Field 05B.
W71-06514

EFFECT OF STRAIN HISTORY ON LIQUEFACTION OF SAND,
British Columbia Univ., Vancouver. Dept. of Applied Science; British Columbia Univ., Vancouver. Dept. of Civil Engineering; and Partner, Cook, Pickering and Doyle Ltd., Vancouver.
W. D. Liam Finn, Peter L. Bransby, and Dennison J. Pickering.
ASCE Proceedings, Journal of the Soil Mechanics and Foundations Division, Vol 96, No SM 6, p 1917-1934, November 1970. 18 p, 12 fig, 4 ref, append. Nat Res Council of Canada Grant No 1498.

Descriptors: *Soil mechanics, *Sands, *Quicksand, *Shear stress, Soil water, Strain, Earth materials, Seepage, Soil engineering, Soil physical properties, Soil strength.
Identifiers: Liquefaction (Sands).

The resistance of a saturated sand to liquefaction under cyclic loading depends on the void ratio, effective stress system and intensity of cyclic loading. The effect of strain history on the resistance to liquefaction was investigated by means of triaxial and simple shear tests. The resistance of a saturated sand to liquefaction is influenced strongly by the previous strain history. Partial liquefaction, which occurs at small shear strains, greatly increases the resistance to liquefaction in subsequent tests. Cycles of large shear strains, or quasi-static shear strains greater than 7.5%, reduces the resistance to liquefaction. The increase in resistance to liquefaction created by a very small shear strain may result from the elimination of small local instabilities in the original sand structure. The loss of resistance caused by larger shear strains is thought to be due to either the creation of a uniform metastable structure or the development of a non-uniform structure. (Knapp-USGS)
W71-06700

SOIL MOISTURE TYPES OF THE AMUR OBLAST (Russian: Tipy Uvlazhennosti Landshaftov Amurskoy Oblasti),
L. F. Nasulich.
In: Teplovoy i Vodnyy Rezhim Nekotorykh Rayonov Sibiri, Leningrad, 'Nauka', p 58-81, 1970. 24 p, 1 map, 14 ref.

Descriptors: *Soil water, *Soils, *Soil moisture, *Hydrogeology, Geomorphology, Streamflow, Land reclamation, Saturated soils, Soil properties, Flooding, Hydrologic aspects, Drainage, Surface-groundwater relationships, Erosion control, Forest management, Water management (Applied).
Identifiers: *Amur Oblast (USSR).

Natural landscapes of the Amur Oblast are examined from the standpoint of soil water and moisture types. Field studies have established 11 soil moisture types, of which 6 are in the forest zone and 5 in the forest-steppe zone. Landscapes described include waterlogged, forested and meadow high plains, forested and scrub flood plains, water logged and forested high flood plains, forested mountains, meadow low and high flood plains, meadow-steppe, forest-steppe and cultivated high plains. Standard correlations are established for constructing various aspects of the winter hydrothermal regimen of the landscape on the basis of snow gage survey data. Reclamation practices aimed at controlling flooding, waterlogging and excess moisture are required for successful land management of reclaimed and recently meliorated soils of varying moisture. To implement these practices, the causes and extent of waterlogging, characteristics of the relief, and the genesis of physical, chemical and other soil properties must be known. (See also W71-06707) (Josefson-USGS)
W71-06710

THE RETENTION OF SELECTED RADIONUCLIDES FROM DILUTE SOLUTIONS BY PANAMANIAN CLAYS,
Florida Univ., Gainesville. Dept. of Environmental Engineering; and Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 05B.
W71-06716

THE NUCLEAR METHOD OF SOIL-MOISTURE DETERMINATION AT DEPTH,
Texas Univ., Austin. Center for Highway Research.
Clarence J. Ehlers, Lymon C. Reese, and James N. Anagnos.
Available from NTIS as PB-194 749, $3.00 in paper copy, $0.95 in microfiche. Research Report 89-4, June 1969. 66 p, 29 fig, 1 tab, 14 ref. DOT supported.

Descriptors: Soil moisture.
Identifiers: *Radiation measuring instruments, *Soil water, *Moisture content, Soils, Performance tests, Neutron absorption, Soil mechanics.

The results are presented of an investigation conducted for the primary purpose of studying the capabilities, limitations, and problems associated with the nuclear method of moisture determination at depth. Nuclear equipment manufactured by Troxler Electronic Laboratories, Inc., was used to measure moisture changes at depth at three different test sites. Moisture contents were obtained using the manufacturer's calibration curve, with the accuracy of the manufacturer's curve being checked in the field by comparing nuclear and gravimetric results. The effect of air gap, the reproducibility of a neutron count, and time and temperature effects were also investigated. The major problem associated with the nuclear method during the investigation was concerned with access-tube installation; a possible solution of the problem in soil containing gravel is discussed. Results showed that the nuclear method of soil-moisture determination was fast and efficient. The accuracy of the nuclear method was found to be satisfactory when compared to gravimetric results, and recalibration of the nuclear equipment was not

necessary. The nuclear method is recommended for studies concerned with the measurement of soil-moisture changes at depth.
W71-06779

SEEPAGE CHARACTERISTICS OF EXPLOSIVELY PRODUCED CRATERS IN SOIL AND ROCK,
Army Engineer Nuclear Cratering Group, Livermore, Calif.; and Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Walter C. Sherman, and Don C. Banks.
Available from NTIS as AD-715 727, $3.00 in paper copy, $0.95 in microfiche. Nuclear Cratering Group Technical Report No 27, Livermore, Calif, Aug 1970. 72 p.

Descriptors: *Soil physical properties, *Permeability, *Seepage, *Rock properties, Groundwater, Porosity, Craters, Excavation, Nuclear explosions, Laminar flow, Mathematical models, Drainage.

This report contains a review of the permeability characteristics of soil and rock formations in both disturbed and undisturbed conditions which are likely to occur in the zones surrounding craters. The report presents methods of determining permeability and tabulates typical values of permeability in a variety of materials. Factors which affect the seepage characteristics of craters are discussed, and a few examples are presented to illustrate the influence of seepage on stability calculations. The data indicate that laminar-flow conditions will prevail in soil and rock formations, dependent upon the size of the pore opening and hydraulic gradient. For a given pore opening, a critical gradient exists above which the flow is found to be turbulent; the technique of constructing flow nets for turbulent flow is illustrated in the report. The correct assessment of seepage conditions in the zones surrounding a crater will depend to a large extent upon the correct evaluation of boundary conditions, such as geological discontinuities and sources of seepage.
W71-06781

AN IRREVERSIBLE THERMODYNAMIC APPROACH TO SIMULTANEOUS MOVEMENT OF WATER, HEAT, AND SALT THROUGH UNSATURATED SOILS,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
C. G. Enfield.
Available from NTIS as BNWL-1429, $3.00 in paper copy, $0.95 in microfiche. Report BNWL-1429, August 1970. 42 p, 2 fig, 48 ref.

Descriptors: Flow, *Thermodynamics, *Heat, *Soil water, Soil moisture, Diffusion, Hydraulic conductivity, Osmotic pressure, *Salts.

Literature was reviewed to obtain the basis for the simultaneous flow of water, heat, and salt through unsaturated soils. Flow theories were developed from the general theory of water flow in saturated soil under isothermal conditions to the analysis of simultaneous solution flow caused by two driving forces, such as water and heat, using irreversible thermodynamics. Based on this review, conclusions were made that the theory of irreversible thermodynamics is the most applicable approach for modeling when both liquid and vapor transport are to be considered.
W71-06795

2H. Lakes

ON THE STAGNATION AND RECENT TURNOVER OF THE WATER IN THE BALTIC,
Fishery Board of Sweden, Goteborg. Hydrographic Department.
For primary bibliographic entry see Field 05C.
W71-06498

SOME LIMNOLOGICAL OBSERVATIONS FROM ENDERBY LAND, ANTARCTICA,
Lehigh Univ., Bethlehem, Pa. Center for Marine and Environmental Studies.
E. E. MacNamara.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 72, 1968. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 3, p 246-255, January 1971. 10 p, 3 fig, 3 tab, 46 ref.

Descriptors: *Limnology, *Antarctic, *Lakes, Ice, Melt water, Water quality, Water chemistry, Primary productivity, Climates, Water balance, Temperature, Thermal stratification.
Identifiers: *Antarctica, *Enderby Land (Antarctica).

The physical and chemical properties and seasonal dynamics of freshwater lakes, ponds, and meltpools of coastal ice-free areas of Enderby Land, Antarctica are discussed. The waters are significantly less mineralized than has been reported in other ice-free areas of the Antarctic. Tentative explanations are location with respect to strom tracks, and true meltwater nature of the lakes. Primary production was variable dependent on many factors. Seasonal temperature cycles in water bodies are factors to be considered in primary production studies. (Knapp-USGS)
W71-07017

STUDY OF LAKES IN THE VICINITY OF MOLODEZHNAYA STATION,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
M. V. Aleksandrov, and A. M. Kozlovskiy.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 72, p 34, 1968. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 3, p 256-259, January 1971. 4 p, 2 fig, 1 tab, 8 ref.

Descriptors: *Limnology, *Antarctic, *Lakes, Ice, Melt water, Water quality, Water chemistry, Primary productivity, Climates, Water balance, Temperature, Thermal stratification.
Identifiers: *Antarctica, *Enderby Land (Antarctica).

In 1967, the glaciological-hydrographic party of the Soviet Antarctic expedition studied the lakes in the coastal area of the western part of Enderby Land. All the lakes encountered are confined to Molodezhnaya Oasis, Vecherniy Oasis, and other small, ice-free land areas. Some shallow and small lakes that lose their ice cover in summer warm up very strongly in summer. Their heat content is quite high. For example, water temperature measurements performed jointly with Japanese scientists on August 25, 1967, in Lake Teploye (provisional name) showed its temperature to be 3.8 deg C in the bottom layer at a depth of 4.8 m, even in the presence of an ice cover 1.6 m thick. All the lakes investigated are fresh, belong to the high-latitude category of lakes, and are fed by snow and ice. They can be divided into two groups according to their ice and thermal regimes: lakes with a persistent ice cover, and lakes that clear of ice in summer. (Knapp-USGS)
W71-07018

CHEMISTRY OF WATER, ICE, AND SNOW IN THE SCHIRMACHER PONDS,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
I. M. Simonov, and K. S. Bonch-Osmolovskaya.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 72, p 41, 1968. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 3, p 260-264, January 1971. 5 p, 2 fig, 1 tab, 8 ref.

Descriptors: *Limnology, *Antarctic, *Lakes, *Water chemistry, Weathering, Saline water intrusion, Melt water, Water quality, Water chemistry, Climates, Water balance, Temperature.
Identifiers: *Antarctica, *Schirmacher Ponds (Antarctica).

The presence of numerous lakes is a characteristic feature of the landscape of the Schirmacher Ponds, Antarctica. There are more than 50 lakes of various sizes in the area. Glacial lakes predominate according to the origin of the water masses and lake basins. The basins were formed by ice excavation. There are also relicit lakes, formed as a result of isolation of sea inlets and lagoons. Most lakes are either drainless or have intermittent drainage. The lakes are fed by meltwater that flows into them only during the short summer, when there is intense melting of numerous snow beds and of the ice slope. In the first five samples, the not readily soluble salts are represented almost exclusively by calcium carbonate, whose content ranges from 0.16 to 0.22 meq/liter. The content of these salts is higher in the waters of Lakes Rozovoye and Krasnoye. In the water sample from Lake Rozvoye, these salts are represented mainly by calcium sulfate (6.38 meq/liter), and in that from Lake Krasnoye, by calcium carbonate (0.54 meq/liter). The water samples from the other lakes do not contain calcium sulfate and their calcium carbonate content is about 0.10 meq/liter; and the content of magnesium carbonate increases gradually from 0.06 to 0.18 meq/liter. All the lakes of the Schirmacher Ponds are fresh. Salts of sea water may penetrate into epishelf lakes because of their contact with the ocean. Sea salts are also brought to the coastal zone of the continent as aerosol by cyclonic winds together with precipitation. Salts are also brought by fresh waters from weathering zones on lakes located in the southern and southeastern parts of Ponds. In the course of weathering, the fresh waters from the continent are enriched with alkali bicarbonates. The freshening effect of snow and ice meltwaters is manifested through an increase of the amount of sulfate, then chloride, and finally, bicarbonate of alkali elements in the Lake waters. (Knapp-USGS)
W71-07019

INSTRUMENTATION FOR STUDY OF ENERGY BUDGET OF RAWSON LAKE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02D.
W71-07035

DETERMINATION OF SOME CHEMICAL AND PHYSICAL RELATIONSHIPS FROM RECORDING METERS IN LAKES,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05A.
W71-07045

2I. Water in Plants

PROBLEMS OF THROUGHFALL AND INTERCEPTION ASSESSMENT UNDER TROPICAL FOREST,
University Coll., Dar-es-Salaam (Tanzania).
I. J. Jackson.
Journal of Hydrology, Vol 12, No 3, p 234-254, February 1971. 21 p, 7 fig, 8 tab, 18 ref.

Descriptors: *Tropical regions, *Interception, *Throughfall, *Precipitation (Atmospheric), Statistical methods, Variability, Regression analysis, Evaporation, Forest, Rain forests, Wet climates, Storms.
Identifiers: *Tropical forests.

A rain gaging experiment in a highland area of northern Tanzania showed the influence of skewness and great variability of throughfall data. For heavy storms, large standard errors make interception estimates unreliable. The techniques of analysis used have a considerable influence on throughfall and interception estimates. Since most previous detailed studies were carried out in temperate latitudes, the effect of tropical foliage upon

interception was poorly known. The graph of interception (median values) against gross rainfall indicates a non-linear relationship and also illustrates the considerable scatter of the data. Attempts to fit a polynomial curve and a logarithmic polynomial curve to storms of under 20 mm proved of little value. Interception values range widely both for individual storms and periods in response to climatic and vegetation factors. This study suggests that interception in tropical forests is fairly low compared to that in temperate forests. (Knapp-USGS)
W71-06474

2J. Erosion and Sedimentation

GRAIN SIZE, MINERALOGY AND CHEMISTRY OF A QUICK-CLAY SAMPLE FROM THE ULLENSAKER SLIDE, NORWAY,
San Diego State Coll., Calif.; and Oslow Univ. (Norway). Inst. of Geology.
Richard W. Berry, and Per Jorgensen.
Engineering Geology, Vol 5, No 1, p 73-84, February 1971. 12 p, 7 fig, 5 tab, 13 ref.

Descriptors: *Clays, *Glacial drift, *Quick clays, X-ray diffraction, Differential thermal analysis, Particle size, Clay minerals, Mineralogy, Soil mechanics, Mass wasting, Mechanical properties.
Identifiers: *Norway.

A detailed laboratory study was made of a quick-clay from a recent quick-clay slide at Ullensaker in Romerike, approximately 40 km northeast of Oslo, Norway. The material is a Quaternary glacial clay, deposited in a marine basin. The clay was studied by fractionation according to grain size, and by mineralogical chemical analyses. Water content is 44.2%; plastic limit is 28.5%; content of particles less than 2 microns is 42%; liquid limit is 43.3%; plasticity index is 14.8; and its activity is 0.35. The median size shows that this is a coarse clay, nearly a silt. The clay is poorly sorted. The dominant mineral in the over 4 micron fraction is quartz. The abundance of quartz fell sharply between 4 and 2 microns to a minor constituent in the smaller size ranges. Feldspar follows the same pattern. The 0.2-0.1 micron fraction shows X-ray peak intensities for illite and chlorite far greater than can be explained by the removal of the quartz dilutant. (Knapp-USGS)
W71-06464

GEOCHEMICAL AND GEOLOGICAL RECONNAISSANCE IN THE SEVENTYMILE RIVER AREA, ALASKA,
Geological Survey, Washington, D.C.
Sandra H. B. Clark, and Helen L. Foster.
For sale by Superintendent of Documents, U.S. Government Print Office, Washington, D.C. 20402 - Price $0.25. Geological Survey Bulletin 1315, 1971. 21 p, 9 fig, 1 tab, 14 ref.

Descriptors: *Geology, *Hydrogeology, *Geochemistry, *Alaska, *Mineralogy, Sampling, Streams, Sediments, Rocks, Soils, Metals, Physical properties, Chemical analysis.
Identifiers: *Seventymile River (Alaska).

Geochemical data were secured from 322 stream-sediment samples, 207 rock samples, and 76 soil samples collected in the Seventymile River area. Geochemical anomalies occur in the Flume Creek-Alder Creek, Crooked Creek, American Creek, and Eagle Bluff areas. Gold in the Flume Creek-Alder Creek area south of the Seventymile River is believed to be associated with ultramafic bodies in a fault zone. Placer gold and other metals in anomalous amounts in stream sediments north of the Seventymile River in the Crooked Creek area may be related to dikes and faults that cut Tertiary and Tertiary sedimentary rocks. Geochemical sampling in the American Creek and Eagle Bluff areas did not define any new mineral deposits, but several anomalies of unknown origin are worthy of further investigation. (Woodard-USGS)
W71-06466

THEORETICAL MODEL FOR MANGANESE DISTRIBUTION IN CALCAREOUS SEDIMENT CORES,
Institut de Physique du Globe, Paris (France).
Gil Michard.
Journal of Geophysical Research, Vol 76, No 9, p 2179-2186, March 20, 1971. 8 p, 3 fig, 2 tab, 14 ref. CNEXO Contract 70 C1917.

Descriptors: *Water chemistry, *Manganese, *Bottom sediments, *Connate water, Ion transport, Calcium carbonate, Diffusion, Distribution patterns, Solubility, Oxidation-reduction potential, Oxidation-carbonate rocks.
Identifiers: *Manganese distribution (Sediments), Calcareous sediments.

A steady state model for manganese distribution in calcareous sediment is presented. In this diffusion-advection model, the chemical reactions involved are (1) Mn.... is oxidized in the top, and (2) Mn.... is sorbed on the solid phase in the reducing conditions of the bottom. A general mathematical solution is given. (Knapp-USGS)
W71-06468

DISSOLVED, SUSPENDED AND BED LOAD MOVEMENT PATTERNS IN TWO O'CLOCK CREEK, ROCKY MOUNTAINS, CANADA, SUMMER, 1969,
Alberta Univ., Edmonton.
H. J. McPherson.
Journal of Hydrology, Vol 12, No 3, p 221-233, February 1971. 13 p, 7 fig, 2 tab, 11 ref. NRC of Canada Grant A 4241.

Descriptors: *Sediment yield, *Sediment load, *Small watersheds, *Rocky Mountain Region, Suspended load, Bed load, Aqueous solutions, Sedimentation, Erosion, Sediment transport, Provenance, Sediment discharge.
Identifiers: *Canada, *Alberta (Canada).

During the summer of 1969, 12850 tons of material were removed as suspended sediment load, 440 tons as dissolved load and 65 tons as bed load from Two O'Clock Creek Basin in the Canadian Rockies. This is equivalent to a surface lowering of the basin by 0.0195 inches per year, a figure which agrees very well with rates of denudation reported by researchers for other mountain areas. During the peak snow melt generated flood in early June, 87% of the total sediment load was exported. Most of the remainder was transported out of the basin by a secondary high flow resulting from rainfall and snow melt in early July. The single most intense rainstorm of the season on August 5 and 6 resulted in a minor increase in stream flow but no increase in sediment discharge. (Knapp-USGS)
W71-06473

CONCEPT OF CRITICAL SHEAR STRESS IN LOOSE BOUNDARY OPEN CHANNELS,
West Virginia Inst. of Tech., Montgomery. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-06482

SEDIMENT TRANSPORTATION MECHANICS: H. SEDIMENT DISCHARGE FORMULAS.

ASCE Proceedings, Journal of the Hydraulics Division, Vanoni, Vito A., Chairman, Task Committee on Sedimentation, Vol 97, No HY4, Paper 8076, p 523-567, April 1971. 45 p, 24 fig, 3 tab, 40 ref.

Descriptors: *Sediment transport, *Bed load, *Sediment load, Sedimentation, Alluvial channels, Discharge (Water), Sediment discharge, Streamflow, Stage discharge relations.
Identifiers: Sediment discharge formulas.

Thirteen well known sediment discharge formulas are presented with a view to making them convenient to use. The basis for each formula is outlined and results of measured bed sediment discharge on two sand bed streams are compared with values calculated with each of the 13 formulas. This is done on a graph of sediment discharge against water discharge for the two streams. In these calculations the relation between water depth, velocity and discharge was calculated by the Einstein-Barbarossa method. These comparisons of results calculated by formulas with measurements and with each other are interesting in that they bring out the great variability of the calculated sediment discharges. However they are of only limited value in determining the general reliability of each formula. (Knapp-USGS)
W71-06483

INITIATION OF RIPPLES ON FLAT SEDIMENT BEDS,
Bechtel Corp., San Francisco, Calif., Slurry Pipeline Development; and University Coll., London (England). Dept. of Civil Engineering.
Philip B. Williams, and Patrick H. Kemp.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY4, Paper 8042, p 505-522, April 1971. 18 p, 10 fig, 10 ref, append.

Descriptors: *Channel morphology, *Scour, *Ripple marks, *Sedimentary structures, *Hydraulic models, Alluvial channels, Sediment transport, Bed load, Turbulent flow, Turbulence, Vortices, Velocity, Reynolds number, Flumes, Open channel flow, Particle size.
Identifiers: Sediment transport models.

For natural sands under turbulent water flow, ripples were found in flume tests, to form on a flat bed from small deformations caused by the random action of high turbulent velocities close to the bed. The deformations affect the grain movement pattern so as to form a bed disturbance or collection of grains that induce a separation eddy to form. The height of such a disturbance was found to be of the order of two or three grain diameters, and the height-to-length ratio is of the order of 1 to 100. Sands with median diameters of 137 micron and 495 micron were used in the experiments. The definition of initial movement of fine sediment established by Grass was extended by these experiments to define the critical conditions for the initiation of ripples from a flat bed. Additional experiments were made in which the grain Reynolds Number was varied by varying the temperature and thus the viscosity of the water. The results suggested that the described mechanism of ripple formation does not operate for grains larger than 600 micron at normal temperatures. (Knapp-USGS)
W71-06484

DEVELOPMENT OF A MEANDERING THALWEG IN A STRAIGHT, ERODIBLE LABORATORY CHANNEL,
Geological Survey of Israel, Jerusalem.
For primary bibliographic entry see Field 08B.
W71-06485

APPLICATIONS OF INFORMATION AND GRAPH THEORY TO MULTIVARIATE GEOMORPHOLOGICAL ANALYSES,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geological Science.
For primary bibliographic entry see Field 07C.
W71-06486

MORPHOLOGY AND QUATERNARY HISTORY OF THE CONTINENTAL SHELF OF THE GULF COAST OF THE UNITED STATES,
Office of Naval Research, Boston, Mass.; and Woods Hole Oceanographic Institution, Mass.
Robert D. Ballard, and Elazar Uchupi.
Bulletin of Marine Science, Vol 20, No 3, p 547-559, 1970. 13 p, 2 fig, 35 ref.

Descriptors: *Continental shelf, *Gulf Coastal Plain, *Sea level, *Water level fluctuations, *Geomorphology, Sedimentation, Stratigraphy, Quaternary Period, Tidal effects, Topography,

Structural geology, Pleistocene Epoch, Paleohydrology.
Identifiers: Historical geology.

Sea-level fluctuations of the Quaternary have greatly influenced the surface morphology of the continental shelf off the gulf coast of the United States. Two prominent shorelines, at 60- and 160-meter depths, and other features found on the gulf shelf can be related to the relatively recent events of the Quaternary, particularly those of the Holocene transgression. Landward of the 40-meter contour, the slow rise of the sea surface and modern sedimentation have produced a complex mixture of topographic expressions. Diapiric structures, which are abundant from De Soto Canyon westward, appear to be of secondary importance in contributing to the shelf's surface relief. (Knapp-USGS)
W71-06493

THE QUANTITY, COMPOSITION AND DISTRIBUTION OF SUSPENDED PARTICULATE MATTER IN THE GULF OF CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W71-06494

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 4,
Woods Hole Oceanographic Institution, Mass.; Geological Survey, Woods Hole, Mass.; and California State Coll., Long Beach.
For primary bibliographic entry see Field 02K.
W71-06497

PHYSICAL PROCESSES OF SEDIMENTATION,
Reading Univ. (England). Sedimentology Research Lab.
John R. L. Allen.
New York, American Elsevier Publishing Company, Inc, $8.50, Earth Science Series No 1, 1970. 248 p.

Descriptors: *Sedimentation, *Sediment transport, *Geomorphology, Sediments, Stratigraphy, Provenance, Sedimentary structures, Deposition (Sediments), Hydraulics, Open channel flow, Alluvial channels, Fluid mechanics, Hydrodynamics, Waves (Water), Winds, Dunes, Tides, Turbidity currents, Glaciers, Glacial drift, Sedimentology.

The properties of sedimentary deposits as related to the physical behavior of the moving fluids encountered naturally in the form of winds, rivers, tides and waves are examined. The material is intended for undergraduates in their second and third years who are relating geology to the physical background of sedimentation, particularly of clastic and bioclastic deposits. The book also serves as a springboard for graduate students who are beginning a training in research in sedimentology. Professional scientists outside the geological field will find the book a guide to fluid dynamics and loose-boundary hydraulics in both industrial and academic applications. Included is a sketch of the physical principles and concepts relevant to the application of fluid dynamics and loose-boundary hydraulics to sedimentation problems of geological interest. This sketch is followed by a more detailed treatment of sedimentation by the wind, in rivers, by waves and tides in shallow water, by turbidity currents at great depth, and by glacier ice. In every case an attempt is made to view the processes quantitatively and to relate as closely as possible the sedimentary products with the processes. (Knapp-USGS)
W71-06503

GEOLOGY, HYDROLOGY, AND GEOPHYSICS OF COLUMBIA SEDIMENTS IN THE MIDDLETOWN-ODESSA AREA, DELAWARE,
Delaware Geological Survey, Newark.
Nenad Spoljaric, and Kenneth D. Woodruff.
Available from NTIS as PB-198 345, $3.00 in paper copy, $0.95 in microfiche. Delaware Geological Survey Bulletin 13, August 1970. 156 p, 23 fig, 10 plate, 13 tab, 15 ref, 4 append. OWRR Project B-002-DEL (2).

Descriptors: *Hydrogeology, *Aquifers, *Delaware, *Alluvial channels, Alluvium, Stratigraphy, Transmissivity, Surveys, Geophysics, Electrical studies, Sediments, Water table, Water yield, Water levels, Water quality, Water sources, Channel morphology, Sedimentation.
Identifiers: Columbia aquifer (Del).

Columbia Formation sediments in the Middletown-Odessa area, Delaware, are composed of boulders, gravels, sands, silts and clays. Subsurface geology was interpreted on the basis of well-log data. The sediments were deposited in channels, flood plains, cut-off meanders, and levees. Twenty-two electrical resistivity soundings and two traverses were made in an attempt to determine the usefulness of the resistivity method in predicting Columbia thickness. Resistivity techniques appear to be useful in determining gross lithologies, but accurate depth solutions are not always possible. The Columbia Formation is the water-table aquifer in the Middletown-Odessa area and in most other parts of the State. Saturated thickness and water levels were determined in the study area by temporary installation of piezometers. The water-table was found to average about 30 feet below land surface in the central part of the study area. The transmissivity of the main paleochannel east of Middletown is about 40,000 gpd/ft. High iron content (1-2 mg/l) and low pH are common, and may present treatment problems. Extrapolation of Columbia aquifer coefficients from one area to another is not reliable and may produce erroneous results. (Knapp-USGS)
W71-06657

SEDIMENT TRANSPORT IN RIVERS AND RESERVOIRS.
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.

Thomas, William A., Editor. Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, 1970. 145 p.

Descriptors: Conferences, *Sediment transport, *Sedimentation, *Sediment control, Erosion, River training, Sediment load, Computer programs, Model studies.

A U.S. Army Corps of Engineers Seminar was held to discuss sedimentation problems. Sediment problems encountered in water resource projects may be classified as either technical or institutional. Technical problems involve predicting the amount and location of sediment deposits and channel degradation, bed forms and their influence on flow depths, the effect of sediment on water quality, and the influence of sediment on the esthetic value of land surrounding reservoirs. Problems involving navigation requirements and bank stabilization structures require detailed knowledge of sediment movement and the resulting bed forms. In problems involving storage depletion in reservoirs and degradation downstream from dams, less detailed information is required. Because basic relationships governing the response of an alluvial stream to its water-sediment discharge are not clearly established, considerable engineering judgment is required to properly determine and solve sediment problems. Results from both analytical and hydraulic model studies should be interpreted only by experienced investigators. (See also W71-06676 thru W71-06686) (Knapp-USGS)
W71-06675

BASIC SEDIMENTATION PROBLEMS,
Corps of Engineers, St. Louis, Mo. Sediment Investigation Section.
D. C. Bondurant.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 1, 1970. 6 p.

Descriptors: *Sedimentation, *Bed load, *Reservoir silting, *Reviews, *Sediment transport, Research and development, Projects, Research facilities, Programs.

Research in bed load sedimentation is briefly reviewed. Substantial progress has been made in: knowledge of bed forms and their general relationships with the flow; appreciation of the effect of a heavy sediment load near the bed upon the distribution of sediment and velocity in stream flow; appreciation of the fact that there are really two zones of turbulent transport in a stream rather than a single zone; and appreciation of the role of secondary currents in the formation of a channel. For progress to be made toward scientific appraisal of the sediment problems involved in channel and reservoir design, it is necessary to encourage a policy of a review of work being done, to plan investigations so that they will be well coordinated, and to encourage active support of the work. (See also W71-06675) (Knapp-USGS)
W71-06676

SEDIMENT YIELDS IN THE UPPER MISSISSIPPI RIVER BASIN,
Corps of Engineers, Rock Island, Ill.
Frank J. Mack.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 4, 1970. 10 p, 6 fig, 1 tab, 7 ref.

Descriptors: *Sediment yield, *Mississippi River, *Mississippi River Basin, Sediment load, Provenance, Geomorphology, Sedimentation rates, Erosion.
Identifiers: *Upper Mississippi River Basin.

The Upper Mississippi River Basin drains an area of 18,000 square miles. The drainage system includes portions of seven states in north-central United States. The basin is relatively low-lying and gently to moderately rolling in character. This is the largest and most productive agricultural area in the United States. Sediment yield rates vary considerably throughout the basin. Generally the sediment yield is approximately 200 to 250 times greater in the extreme southern portion of the basin in comparison with the yields in the extreme northern part of the basin. As the size of the drainage area increases, the rate of sediment production per square mile decreases. This is the result of several factors. The chances that an intense storm will occur over the entire watershed become less and less as the watershed becomes larger. There is more variation in the rate of sediment production in smaller watersheds due to the fact that all physical factors vary more widely. The percentage of area of steep surface slopes with correspondingly high erosion rates decreases with the larger drainage area, which would tend to decrease the sediment yield per square mile of the larger basins. (See also W71-06675) (Knapp-USGS)
W71-06677

SEDIMENT PROBLEMS IN ST. LOUIS HARBOR,
Corps of Engineers, Vicksburg, Miss. Hydraulic and Reservoir Regulation Section.
James R. Tuttle.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 7, 1970. 15 p, 4 fig, 3 tab, 4 ref, 2 map.

Descriptors: *Mississippi River, *Missouri River, *Sediment load, *Silting, *Harbors, Sedimentation, Deposition (Sediments), Hydraulic models, Model studies, Shallow water, Navigation.
Identifiers: *St. Louis Harbor.

The problem of inadequate depths at docks within the St. Louis Harbor apparently occurs infrequently but is quite troublesome. During high flow years bed-material samples indicate median diameters ranging from 0.6 to 1.1 mm as compared to median diameters of about 0.3 mm during years of low flow. Sand rating curves developed at Hermann and St. Louis indicate that the Mississippi River at St. Louis is not capable of carrying the sand load delivered by the Missouri River. The respective annual ratings are 30 million tons at Hermann and 22 million tons at St. Louis. Data are not available in sufficient detail to make reasonable numerical analyses; therefore, a model study is being conducted by the Waterways Experiment Station on the St. Louis Harbor. (See also W71-06675) (Knapp-USGS)
W71-06678

THE QUANTITY AND QUALITY OF SEDIMENTS DEPOSITED IN CLEVELAND HARBOR AT CLEVELAND, OHIO,
Corps of Engineers, Chicago, Ill.
David L. Sveum.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 8, 1970. 16 p, 5 plate, 6 tab, 8 ref.

Descriptors: *Sedimentation, *Silting, *Water pollution sources, *Lake Erie, *Ohio, Harbors, Provenance, Sediments, Sediment load, Water pollution effects, Dredging, Waste disposal, Landfills.
Identifiers: Cleveland Harbor.

Erosion of the Cuyahoga River valley and its tributaries bring large quantities of sediment to the main stream, which are carried into Cleveland harbor. Erosion of areas disturbed by construction also produces sediment. Considerable quantities of municipal wastes, flue dust and other forms of industrial waste are deposited in the harbor. All of the materials which are deposited in the navigation channel must be removed by maintenance dredging. The materials so removed are considered to be grossly polluted, and continuation of the historical practice of disposing thereof by pumping in deep waters of Lake Erie, is considered to be inimical to the ecology of the lake. The average annual volume of the sediment inflow to Cleveland Harbor is about 1,242,000 cubic yards. The cheapest effective method of disposal, as an alternate to open lake disposal, is the use of diked containment areas near navigation projects. Disposal by loading the material from the settling basin into trucks for transportation to landfill sites appears to have merit for this location and is being given further consideration. A pilot program included construction of pilot scale diked disposal areas at a few locations. (See also W71-06675) (Knapp-USGS)
W71-06679

THE ROLE SEDIMENTS PLAY IN DETERMINING THE QUALITY OF WATER,
Corps of Engineers, Omaha, Nebr. Hydro-Sediment Section.
Robert H. Livesey.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 9, 1970. 7 p, 1 plate.

Descriptors: *Sedimentation, *Water pollution effects, *Water pollution control, *Reviews, Sediment transport, Path of pollutants, Eutrophication.
Identifiers: *Sedimentation-water quality relations.

Sediment-related pollution problems are reviewed by discussing some examples. In the waste assimilation capability of both suspended and streambed sediment, exchange processes play the key role, assisted by hydraulic conditions. Sedimentation affects the biological environment by changing the ability of the aquatic community to function adequately and vigorously. Sedimentation plays an important role in the eutrophication processes of lakes and reservoirs. Turbidity influences the depth of the photosynthetic region. Pollutants attached to sediment particles are not dispersed or transported as rapidly as dissolved pollutants; large concentrations may build up in bed deposits awaiting a significant change in water chemistry to release the concentration into solution, or such concentrations can be removed from the water environment by burial in delta deposits. (See also W71-06675) (Knapp-USGS)
W71-06680

THE INTERRELATIONSHIP BETWEEN WATER TEMPERATURE, BED CONFIGURATION, AND SEDIMENT CHARACTERISTICS IN THE MISSOURI RIVER,
Army Corps of Engineers, Omaha, Nebr.
Warren J. Mellema.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 10, 1970. 7 p, 7 ref.

Descriptors: *Missouri River, *Sediment transport, *Suspended load, *Water temperature, *Viscosity, Turbidity, Deposition (Sediments), Stage-discharge relations, Discharge (Water), Suspension, Sedimentation.
Identifiers: Water temperature-sedimentation relations.

Research directed toward the development of prediction equations for the determination of sediment discharge in sand bed streams is reviewed. Most of the developments to date involve examination of results of detailed flume or laboratory investigations. Measurements obtained on streams where the discharge is held constant tend to dampen out many of the normal fluctuations found in most natural streams. Selected reaches of the Missouri River fit into this category, and field investigations are made on one of these reaches. A downward shift is observed in the stage-discharge relationship of about 1-1 1/2 to 2 feet in the fall months with little or no variation in discharge. Closely associated with this shift is a lower water temperature. A decrease in temperature increases viscosity and decreases particle fall velocity. If a sufficient number of particles in certain critical size ranges are available in the stream bed, a dramatic change in the total sediment load of the stream can occur. The presence of more fine sediment in the flow tends to further decrease the fall velocity of the coarser suspended particles. A major change in the water temperature can therefore have a very significant influence on a stream's ability to transport material in suspension. (See also W71-06675) (Knapp-USGS)
W71-06681

SEDIMENTATION STUDIES FOR ROBERT S. KERR LOCK AND DAM, ARKANSAS RIVER BASIN,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
Howard O. Reese.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 12, 1970. 14 p, 5 tab, 4 ref, 6 plate.

Descriptors: *Hydraulic models, *River training, *Stream stabilization, *Sediment control, Channel improvement, Sedimentation, Sediment transport, Dam construction, Model studies.
Identifiers: *Sedimentation models.

The solution of major sedimentation problems played an important role in the planning, design, and construction of the Arkansas River multiple-purpose project. Investigations included the determination of natural and modified sediment loads, sediment deposits in channels and reservoirs and degradation below dams, and the prediction of modified channel regime. Sedimentation studies conducted for one individual reservoir project, Robert S. Kerr Lock and Dam, of the Arkansas River multiple-purpose project are reviewed. The presence of coarse gravel in the bed hinders the rate of degradation, and in certain areas coarse gravel combined with the relatively nonmoving very coarse gravel should armor the bed. In those areas where a gravel control or armoring might occur, selective dredging may be necessary to expose the bed to flow which can cause an increase in the rate of degradation. This may have to be repeated several times to lower the bed to desired levels that would correspond with the 50-year weighted tailwater rating curve. It is not anticipated that major dredging should be necessary to lower the tailwater rating curve to the design level. (See also W71-06675) (Knapp-USGS)
W71-06683

A DIGITAL MODEL FOR SIMULATING SEDIMENT MOVEMENT IN A SHALLOW RESERVOIR,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
For primary bibliographic entry see Field 06A.
W71-06684

THE KANSAS CITY DISTRICT SUSPENDED SEDIMENT LOAD COMPUTER PROGRAM,
Corps of Engineers, Kansas City, Mo.
Charles H. Sullivan.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 14, 1970. 6 p, 9 fig, 2 tab.

Descriptors: *Computer programs, *Sediment discharge, *Data processing, Data collections, Hydrologic data, Sediment yield, Sedimentation, Discharge (Water), Suspended load, Sampling.
Identifiers: *Suspended load computation.

A computer program was developed for computing daily suspended sediment loads. Lacking the intuition of the trained engineer, the computer results were found to be poor if daily average discharges were used. It was determined that much better accuracy could be developed by use of bihourly discharges. This suspended sediment program is operable and being used on a 301 RCA computer. The results available are within the reasonable range of accuracy. As additional stations are computed, possible additional analysis can be made for a predicting type of program. The operating time for computing stations for one year is 20 minutes. Normally, daily, monthly, and yearly suspended sediment loads are printed out. Bihourly load printout can be made when a specified c.f.s. value is exceeded during the day. This program is coded in Fortran II and can be obtained from the Kansas City District Office, Corps of Engineers. (See also W71-06675) (Knapp-USGS)
W71-06685

CURRENT DUTCH PRACTICE FOR EVALUATING RIVER SEDIMENT TRANSPORT PROCESSES,
Corps of Engineers, St. Paul, Minn. Reservoir and Hydrologic Engineering Section.
Helmer O. Johnson.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 15, 1970. 11 p, 5 fig, 6 ref, 2 append.

Descriptors: *Sediment transport, *Sedimentation, *Reviews, *Scour, Discharge (Water), Suspended load, Bed load, Surveys, Data processing, Channel morphology, River training.
Identifiers: *Dominant discharge.

Man-made intervention in natural river systems will result in changes of sediment transport, scour and deposition. Knowledge of the mechanism of sediment transport will give insight into the expected

results of artificial intervention and will decrease the chance of failure. This paper surveys the procedures relative to river processes and sediment transport which are currently being used in Europe and particularly in the Netherlands. The dominant discharge procedure enables engineers to determine the bed forming discharge of a river and also can serve as a guide in the design of river groynes (wing dams). Dutch engineers recommend that the height of groynes be governed by the dominant water level (dominant discharge) so as not to interfere with flood discharges. (See also W71-06675) (Knapp-USGS)
W71-06686

DETERMINATION OF THE MANNING COEFFICIENT FROM MEASURED BED ROUGHNESS IN NATURAL CHANNELS,
Geological Survey, Washington, D.C.
J. T. Limerinos.
For sale by Superintendent of Documents, US Government Printing Office, Washington, DC. 20402, 35 cents. Geological Survey Water-Supply Paper 1898-B, 1970. 47 p, 9 fig, 5 tab, 27 ref.

Descriptors: *Sediments, *Streambeds, *Particle size, *Sediment distribution, *Mannings equation, Natural streams, Channel flow, Discharge coefficients, Roughness (Hydraulic), Mathematical studies, Streamflow, Flow measurement, Sediment transport, Alluvium, Alluvial channels, Hydraulics.
Identifiers: *Streambed roughness, Bed material.

This report presents the results of a study to test the hypothesis that basic values of the Manning roughness coefficient of stream channels may be related to (1) some characteristic size of the streambed particles and to (2) the distribution of particle size. Fifty current-meter measurements of discharge and appropriate field surveys were made at 11 sites on California streams for the purpose of computing the roughness coefficient by the Manning formula. The test sites were selected to give a wide range in average size of bed material, and the discharge measurements and surveys were made at such times as to provide data covering a suitable range in stream depth. The characteristic bed-particle sizes used in the analyses were the 16-, 50- and 84-percentiles sizes as obtained from a cumulative frequency distribution of the diameters of randomly sampled surficial bed material. Separate distributions were computed for the minimum and intermediate values of the three diameters of a particle. No significant difference in reliability was found between the results obtained using minimum diameters and those obtained using intermediate diameters. The relations best fitting the field data for this study were obtained by using either a characteristic particle diameter equal to the 84-percentile size or a diameter obtained by weighting three characteristic particle sizes. (Woodard-USGS)
W71-06691

SLAMTRANSPORTUNDERSOKELSER I NORSKE BRE-ELVER 1969 (SEDIMENT TRANSPORT STUDIES AT SELECTED GLACIER STREAMS IN NORWAY 1969) (Norwegian),
Norwegian Water Resources and Electricity Board, Oslo.
G. Ostrem, T. Ziegler, and S. R. Ekman.
Norges Vassdrags-Og Elektrisitetsvesen Report 6/70, Vassdragsdirektoratet Hydrologisk Avdeling, September 1970. 68 p, 29 fig, 20 ref.

Descriptors: *Sediment transport, *Streams, *Glaciers, Streamflow, Geology, Meteorology, Sedimentation, Sediment load, Suspension, Bed load, Particle size, Melt water, Sampling, Methodology, Planning, Hydrologic data, Data collections, Water utilization, Hydroelectric power.
Identifiers: *Glacier streams (Norway), *Norway.

The sediment transport studies undertaken at Norwegian glacier streams is a joint venture between the Norwegian Water Resources and Electricity Board and the Department of Physical Geography at Stockholm University. The aim of the investigations is to gain knowledge about the magnitudes and variations of sediment transport in glacier streams including the study of deposition of such material. The data has an important bearing on the planning of the future hydro-electric projects utilizing glacier meltwater streams and also for studying glacier erosion which the transported sediments are a result of. In 1969 an attempt was made to determine the bed load transport from Nigardsbreen by trapping all the coarse material in a constructed steel-net. A description of this experiment is given. Water samples were collected 2-5 times daily at one or more observation sites along the glacier streams during a field period. During flood conditions samples were taken hourly. A synopsis of the results from the investigations in 1969 are presented together with the results of studies from previous years. The table demonstrates clearly the variations in the volumes of transported sediments that exist between the individual glaciers and fluctuations in the volumes of transport for one and the same glacier from year to year are revealed. (Woodard-USGS)
W71-06694

RIVER-COAST INTERACTION: LABORATORY SIMULATION,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
Omar H. Shemdin.
ASCE Proceedings, Journal of the Waterways, Harbors and Coastal Engineering Division, Vol 96, No WW 4, p 755-766, November 1970. 12 p, 11 fig, 2 ref, append.

Descriptors: *Hydraulic models, *Sedimentation, *Sand bars, *Backwater, Coastal engineering, Deposition (Sediments), Water levels, Sedimentary structures, Erosion, Floods, Hydraulic similitude, Shoals.
Identifiers: *River coast interactions.

The flow of a river into the ocean is often obstructed by a sand bar at the river mouth. The interaction of a river with the coast can be simulated in a hydraulic model with a movable bed. Use was made of the equation of continuity of sediment flow to arrive at similarity relationships. The method was used successfully for the Yaquez River in Puerto Rico. Water surface elevation in the river rises because of the obstruction of the bar at the river mouth. The highest water elevation occurs before the peak flow arrives at the mouth. Coastal structures were tested to minimize the water elevation. The method offers a useful coastal engineering tool but work is needed to include the influence of waves. (Knapp-USGS)
W71-06697

WATER WAVES GENERATED BY LANDSLIDES,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 02E.
W71-06698

EFFECT OF STRAIN HISTORY ON LIQUEFACTION OF SAND,
British Columbia Univ., Vancouver. Dept. of Applied Science; British Columbia Univ., Vancouver. Dept. of Civil Engineering; and Partner, Cook, Pickering and Doyle Ltd., Vancouver.
For primary bibliographic entry see Field 02G.
W71-06700

A REVIEW OF THE WORK OF THE JAROSLAV CERNI INSTITUTE FOR THE YEAR 1968,
Institut za Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 02E.
W71-06704

BULK DENSITY OF SEDIMENTS IN RIVER RESERVOIRS,
V. Miloradov.
Transactions Institute for Development of Water Resources, 'Jaroslav Cerni,' Vol 14, No 45, p 5-12, 1969. 8 p, 4 fig, 3 tab, 8 ref.

Descriptors: *Bulk density, *Sedimentation, *Reservoir silting, Sediment yield, Silts, Sediment transport, Reviews, Sampling, Surveys.
Identifiers: *Yugoslavia, *Danube River.

For forecasting sedimentation in newly designed reservoirs, equations are given in terms of the bulk density of sediment. However, bulk density cannot be measured on sediments from the river for which the reservoir is designed because they usually do not correspond to the sediments that will be deposited once the reservoir is constructed. To assess some criteria for the choice of bulk density in calculations for the Derdap Power Plant on the Danube, data from the literature was reviewed and new data were collected in Yugoslav rivers and reservoirs. (See also W71-06704) (Knapp-USGS)
W71-06706

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1969.
Bureau of Reclamation, Washington, D.C.

Water Resources Council, Sedimentation Committee Annual Report, 1970. 207 p, 1 fig, 4 tab, append.

Descriptors: *Sedimentation, *Documentation, *Publications, *United States, Programs, Projects, Bibliographies, Sediment transport, Streams, Reservoirs, Lakes, Sediment yield, Sedimentation rates, Particle size, Erosion, Sedimentology.
Identifiers: *Sedimentation activities (USA), Suspended sediment.

This report is a digest of information furnished by all Federal agencies conducting sedimentation investigations on work in progress or planned, important findings, new methods, new publications, laboratory and other research activities, and other pertinent information. The material has been organized by major drainage regions in the conterminous United States, Alaska, Hawaii, Puerto Rico, and Okinawa. Other major headings include Foreign Acitivities and Laboratory and Other Research Activities. An excerpt from the Catalog of Information on Water Data, Index to Water Quality Stations, 1970 edition, compiled by the Geological Survey, Office of Water Data Coordination, is included as Appendix A. This excerpt is a list, as of January 1970, of long-term water quality sites at which sediment data have been collected. Appendix B is a listing of agency addresses by departments where additional information on agency activities can be obtained. (Woodard-USGS)
W71-06720

CONTINENTAL SHELF AND UPPER SLOPE SEDIMENTS OFF PORTUGESE GUINEA, GUINEA, AND SIERRA LEONE, WEST AFRICA,
Rhode Island Univ., Kingston. Graduate School of Oceanography; and Woods Hole Oceanographic Institution, Mass.
Robert L. McMaster, John D. Milliman, and Asaf Ashraf.
Journal of Sedimentary Petrology, Vol 41, No 1, March 1971, p 150-158. 9 p, 5 fig, 20 ref. ONR Contract N00014-68-A-0215-0003.

Descriptors: *Bottom sediments, *Provenance, *Continental shelf, *Continental slope, *Sedimentation, Stratigraphy, Deposition (Sediments), Sediment transport, Waves (Water), Tides, Tidal effects, Deltas.
Identifiers: *Africa.

Sediments on the continental shelf off Portuguese Guinea, Guinea, and Sierra Leone are mainly terrigenous, and have been stream derived. Except for

a lobe of terrigenous material extending seaward from the Orango Delta, most sediments on the outer shelf and upper slope are rich in shallow-water biogenic carbonate and weathered glauconite, suggesting severe restriction in the offshore transport of detrital sediments, both at present and during the last low stand of sea level. In general the surface sediments are medium to fine sands, moderately to moderately well sorted and negatively skewed. For the most part these sands accumulated during the Pleistocene. However, the Holocene transgression and accompanying environmental processes have modified these sediments so that distinctive grain size parameters that characterized their original depositional environments can no longer be detected. Silts and clays on the Bissagos Delta front, derived from the Cacheo and Geba Rivers and probably the Casamance River, are the only sediments presently accumulating on the middle or outer shelf in this area. Coastal and tidal currents may have moved some of this sediment toward the south, where it has been funneled locally into the deep sea. (Knapp-USGS)
W71-06988

PALEOFLOW CHARACTERISTICS OF A LATE CRETACEOUS RIVER IN UTAH FROM ANALYSIS OF SEDIMENTARY STRUCTURES IN THE FERRON SANDSTONE,
Bucknell Univ., Lewisburg, Pa. Dept. of Geology and Geography.
Edward Cotter.
Journal of Sedimentary Petrology, Vol 41, No 1, p 129-138, March 1971. 10 p, 5 fig, 46 ref.

Descriptors: *Paleohydrology, *Alluvial channels, *Sedimentary structures, *Stratigraphy, Bed load, Suspended load, Sand waves, Dunes, Streamflow, Mannings equation, Sandstones, Petrofabrics, Utah.
Identifiers: Ferron sandstone (Utah).

Interpretation of sedimentary sturctures and detailed stratigraphic relations of the fluvial facies of the Upper Cretaceous Ferron Sandstone in the Castle Valley in east-central Utah permits reasonable reconstruction of many parameters of a Late Cretaceous alluvial system. The width and depth of flow of the ancient Ferron River were estimated from the geometry of preserved sedimentary structures, and the type of sediment transported by the river was determined by studying the sandstone texture. Various relationships of modern streams empirically derived by Schumm are used to estimate channel sinuosity, meander length, mean annual discharge, mean annual flood, channel slope, and flow velocity. Values derived for the slope and velocity are supported by other indirect methods based on the Manning equation. It appears likely that the Late Cretaceous Ferron River was about 300 feet wide and 25 feet deep, and that it was highly sinuous, with meander lengths of 2,500 to 4,100 feet. As the 200-mile-long river drained an area to the southwest of 6,000 to 8,000 square miles, it had a mean annual discharge of approximately 6,000 to 7,000 cubic feet per second and a mean annual flood of about 22,000 cfs. Although only 2 percent of the total river load was bedload, the flow velocity of between 2.0 and 4.6 feet per second in the upper part of the lower flow regime caused the fine- to medium-grained sand to be in a dune bed configuration. (Knapp-USGS)
W71-06989

WAVE EFFECTIVENESS AT THE SEA BED AND ITS RELATIONSHIP TO BED-FORMS AND DEPOSITION OF MUD,
University of East Anglia, Norwich (England). School of Environmental Sciences.
I. N. McCave.
Journal of Sedimentary Petrology, Vol 41, No 1, p 89-96, March 1971. 8 p, 7 fig, 1 tab, 25 ref.

Descriptors: *Waves (Water), *Bottom sediments, *Sediment transport, *Suspended load, *Muds, Sedimentation, Turbulence, Currents (Water).
Identifiers: *Wave effectiveness, North Sea.

A wave effectiveness parameter is defined as the product of theoretical instantaneous sediment transport rate times frequency, for wave action at the sea bed. High values of this parameter are found in waters shallower than 18 m. in the southern North Sea and are related to absence of sand waves at these depths. Mud deposition occurs in certain shallow areas of the southern North Sea where the concentration of suspended sediment is high. Farther offshore, where suspended sediment concentration is low and wave activity moderate no mud deposits are found. With increasing depth, more mud is found in the bottom sediment. In the Celtic Sea the wave effectiveness parameter has the same value at 73 m. as it does in the North Sea at 30 m. This is close to the sand/mud boundary in the bottom sediments of both areas. Wave activity is only one factor--others being suspended sediment concentration and cirrent velocity--influencing deposition of mud. Some ancient mudstone could have been deposited in shallow waters off exposed coasts. (Knapp-USGS)
W71-06990

PSEUDO-PLANAR STRATIFICATION PRODUCED BY VERY LOW AMPLITUDE SAND WAVES,
Illinois Univ., Chicago.
Norman D. Smith.
Journal of Sedimentary Petrology, Vol 41, No 1, p 69-73, March 1971. 5 p, 6 fig, 19 ref.

Descriptors: *Sedimentary structures, *Sand waves, Ripple marks, Stratigraphy, Alluvial channels, Bed load, Sediment transport, Dunes.
Identifiers: Platte River (Nebr).

Thin sand sheets with downstream foresets form in very shallow depths in the Platte River and resemble small sand waves. They produce internal horizontal stratification which is superficially similar to upper flow regime plane bed deposits except that the grains are differentiated into alternating coarse and fine laminations by sorting processes at the foreset. A 12-inch bed of horizontal laminae exposed in a river bank formed by accretion of low amplitude sand waves on a floodplain during slowly increasing flood stages. (Knapp-USGS)
W71-06991

QUARTZ GRAIN ORIENTATIONS -- 1 (THE PHOTOMETRIC METHOD),
Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.
R. F. Sippel.
Journal of Sedimentary Petrology, Vol 41, No 1, p 38-59, March 1971. 22 p, 23 fig, 1 tab, 15 ref.

Descriptors: *Sedimentary petrology, *Microscopy, *Sedimentary structures, *Petrofabrics, *Sandstones, Particle shape, Particle size, Petrology, Sedimentary rocks, Petrography.
Identifiers: *Particle orientation (Sediments).

Among several rapid methods which have been suggested for measuring sandstone grain orientation, the photometric method has much to recommend it. Crystallographic methods are applicable except in very rare instances, and have unique advantages compared to the particulate methods. This paper employs the Jones Calculus, a powerful method for polarized light calculations. With its help a quantitative theory of the photometer is presented. An optimum form of the photometer is derived and compared with the form originally suggested. Photometer action is simulated in the computer, and the instrument is tested for ability to analyze assumed three-dimensional distributions of quartz grain c axes. Effect of porosity, thin section thickness, inclination of the preferred direction, and strength of preferred orientation are all evaluated for each instrument. (Knapp-USGS)
W71-06992

MEASUREMENT OF C INTERCEPTS IN LOOSE SAND GRAINS BY OPTICAL HEIGHT,
Idaho State Univ., Pocatello.
William B. Wadsworth.
Journal of Sedimentary Petrology, Vol 41, No 1, p 30-37, March 1971. 8 p, 5 fig, 1 tab, 25 ref.

Descriptors: *Particle shape, *Microscopy, *Measurement, Sedimentology, Shape, Analytical techniques, Particle size, Statistics, Statistical methods, Variability.
Identifiers: *Particle shape determination.

A procedure for directly measuring the shortest axis of an individual particle by focusing a microscope successively on its mounting surface and then on its highest point is found to be feasible. This distance, as read from a calibrated fine-focus drum, is both highly accurate and sufficiently precise for most purposes, though an easily determined correction factor may be required for built-in bias of the focus calibration. Comparison of 200 optical height measurements on 40 grains with paired observations derived by eyepiece micrometer demonstrates an identity of mean values. Optical height data are nearly three times less precise; nevertheless, roughly 170 of 200 observations occur within six percent of their group mean values throughout the sand size range. After initial calibration of the microscope, no preparatory stages in grain mounting or equipment manufacture are required; the routine petrographic microscope and accessories are sufficient for optical height determinations. The result is a procedure which permits essentially simultaneous measurement of all three principal grain diameters, giving immediate access to three-dimensional grain size and shape information and the advantage of direct measurement. (Knapp-USGS)
W71-06994

THE RELATIONSHIP BETWEEN SPHERE SIZE AND SETTLING VELOCITY,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
Ronald J. Gibbs, Martin D. Mathews, and David A. Link.
Journal of Sedimentary Petrology, Vol 41, No 1, p 7-18, March 1971. 12 p, 1 fig, 6 tab, 18 ref.

Descriptors: *Sedimentation, *Settling velocity, *Particle size, Viscosity, Sediment transport, Deposition (Sediments), Instrumentation, Equations, Laboratory tests, Stokes law, Density.
Identifiers: *Settling tubes.

The settling velocities in water of 216 glass spheres ranging in size from 50 to 5000 microns in diameter were determined. The size, density, and shape of these spheres were accurately known. All timing precisions were better than 1/2% and the combined precision (size, shape, density, timing, etc) of the velocity measurements was less than 2% at a 95% confidence level. Based on this data an empirical equation was derived to give the relationship between sphere size and settling velocity. The range of usefulness of the equation includes spheres from 0.1 micron to 6 mm diameter and, with correction factors, is extended to 50 mm spheres. Tables are presented relating various sphere diameters, water temperatures, sphere densities, and fluid salinities. The equation may be used as a basis of standardization of settling tube data and as a basis for determining the sedimentation diameter. (Knapp-USGS)
W71-06995

CASE-HARDENING OF CARBONATE ALLUVIUM AND COLLUVIUM, SPRING MOUNTAINS, NEVADA,
Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
Laurence H. Lattman, and Elliott M. Simonberg.
Journal of Sedimentary Petrology, Vol 41, No 1, p 274-281, Mar 1971. 8 p, 9 fig, 2 ref. AF Cambridge Lab. Contract No F 19628-68-C-0136.

Descriptors: *Alluvium, *Water chemistry, *Diagenesis, *Seepage, *Leaching, Calcite, Calcium carbonate, Limestones, Recharge, Groundwater movement, Nevada, Chemical precipitation, Caliche.
Identifiers: Spring Mountains (Nevada).

Case-hardening of vertical faces of alluvium and colluvium in, and flanking, the Spring Mountains, Nevada, begins within one or two years after exposure and may proceed to the extent that samples break through clasts. The alluvium and colluvium consist primarily of carbonates, and the cementation which causes the case-hardening appears to be due to solution of the sand-sized and finer carbonate fractions and subsequent deposition of calcite. Above present drainage channels the case-hardening seems to be caused by surface runoff, and the rapidity and degree of cementation is controlled by the texture of layers and lenses within the colluvium and alluvium. Along the present drainage, the case-hardening appears to be due to influent seepage from the streams during spring runoff or during infrequent summer showers and is little affected by texture. (Knapp-USGS)
W71-06996

SOURCE AND MIXING OF INSOLUBLE CLAY MINERALS IN A SHALLOW WATER CARBONATE ENVIRONMENT - FLORIDA BAY,
University of South Florida, Tampa. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W71-06997

LIFT FORCES ON SUSPENDED SEDIMENT PARTICLES IN LAMINAR FLOW: EXPERIMENTS AND SEDIMENTOLOGICAL INTERPRETATION,
Massachusetts Inst. of Tech., Cambridge.
John B. Southard.
Journal of Sedimentary Petrology, Vol 41, No 1, p 320-324, March 1971. 5 p, 1 fig, 6 ref. ONR Contract Nonr 1841 (74)-NR083-157.

Descriptors: *Sediment transport, *Laminar flow, *Bed load, *Tractive forces, Flow, Sedimentation, Alluvial channels.
Identifiers: Lift forces (Sedimentation).

A sphere carried by laminar flow past a planar boundary is affected by a force away from the boundary. The sedimentological implications of this effect, both for transportation of coarse sediment in strong turbulent flows and for deposition of fine sediments from oceanic bottom currents, were explored by estimating the lift force on small, nearly neutrally buoyant spheres suspended in laminar flow in a laboratory flume and evaluating how closely this models the lift force in the natural flows. This lift-force effect is probably not important in natural sedimentary processes. (Knapp-USGS)
W71-06998

A TEST OF VALIDITY OF QUARTZ GRAIN ORIENTATION AS A PALEOCURRENT AND PALEOENVIRONMENTAL INDICATOR,
Guelph Univ. (Ontario). Dept. of Soil Science.
I. P. Martini.
Journal of Sedimentary Petrology, Vol 41, No 1, p 60-68, March 1971. 9 p, 6 fig, 2 tab, 20 ref.

Descriptors: *Sedimentary structures, *Paleohydrology, *Sedimentation, *Petrofabrics, *Microscopy, Sandstones, Particle shape, Particle size, Petrology, Sedimentary rocks, Petrography.
Identifiers: *Particle orientation (Sediments).

Analysis of quartz grain orientation in a set of 261 thin sections obtained from the Thorold and Grimsby Sandstone (Silurian, S.W. Ontario and New York State) indicates that: (1) The number of measurements needed for a petrographic analysis of grain orientation varies from 50-100 in thin sections cut perpendicular to the depositional surface, to 150-250 in thin sections cut parallel to the depositional surface; (2) preferred grain imbrications are encountered in the vast majority of the samples examined. Vertical thin sections cut parallel to the vector mean of the H-grain orientation show a tendency to have an average imbrication value significantly different from zero, hence usable for paleocurrent determinations. Grain orientation distributions are useful in sedimentological paleoenvironmental reconstructions. The grain imbrication populations measured in apparently massive beds are a mixture of grain imbrications and of H-grain orientations. The vector means of the h-grain orientation of the massive beds can be utilized as valid line of movement data. (Knapp-USGS)
W71-06999

MIXING AT TURBIDITY CURRENT HEADS, AND ITS GEOLOGICAL IMPLICATIONS,
Reading Univ. (England). Sedimentology Research Lab.
J. R. L. Allen.
Journal of Sedimentary Petrology, Vol 41, No 1, p 97-113, March 1971. 17 p, 8 fig, 1 tab, 35 ref.

Descriptors: *Sediment transport, *Mixing, *Turbidity currents, *Sedimentary structures, Bottom sediments, Bed load, Suspended load, Mathematical studies, Variability, Turbidity, Turbulence, Turbulent flow, Density currents, Continental slope.
Identifiers: Gravity currents.

The shape of the head of a turbidity current is consistent with an inflow of the ambient medium into the current along clefts and tunnels regularly spaced along and back from the overhanging front of the head. When the rate of inflow of the ambient medium into the head is expressed mathematically, it is shown that the bed shear stresses exerted in the region of the head vary transversely across the region with a spatial periodicity. The deduced force structure of the head region explains the occurrence on turbidite soles of regular bands or clusters of flute marks aligned parallel with flow. The near-bed flow in the head is strongly three-dimensional, and this may explain the commonly observed non-parallelism of the sole markings observed on single bedding surfaces. The rates of inflow of the ambient medium into the head are found to be large enough to account for the density reduction necessary for the transformation of a liquified sediment slump into a turbidity current in a journey down the continental slope and upper rise. (Knapp-USGS)
W71-07000

RELATIONSHIP BETWEEN GRAIN SIZE PARAMETER DISTRIBUTION AND CURRENT PATTERNS IN THE GIRONDE ESTUARY (FRANCE),
Inst. of Gelogie du Bassin d'Aquitaine, Facultes des Sciences, Bordeaux, France.
For primary bibliographic entry see Field 02L.
W71-07001

PARTICLE SHAPE: CLASSIFICATION OF THICKNESS USING SLOTTED SCREENS,
Gulf Research and Development Co., Pittsburgh, Pa.
John C. Ludwick.
Journal of Sedimentary Petrology, Vol 41, No 1, p 19-29, March 1971. 11 p, 5 fig, 4 tab, 23 ref.

Descriptors: *Particle shape, *Sieve analysis, *Sieves, Shape, Analytical techniques, Separation techniques, Measurement, Particle size, Settling velocity.
Identifiers: *Particle shape determination.

A shape classification of sand particles according to thickness is obtained by sieving a sediment sample through a nest of several screens with slotted openings, the widths of which are smaller in each subjacent screen. The sample is first sieved through a pair of round-holed screens, the openings of which are nearly the same. This produces a subsample narrowly limited in particle size. The shape distribution in the sediment fraction obtained through use of the round-holed screens is unbiased. The distributions of particle thickness in the individual slotted screen fractions are bell-shaped, skewed depending on location relative to the modal class, and overlapping to a predictable degree. In using the method, slotted screen fraction weights are converted to number of particles per fraction. These particles are distributed keeping the areas under the individual distributions proportional to the corresponding number of particles. The numbers of particles per standard class interval of particle thickness are summed over the different distributions to yield the desired distribution of relative particle thickness for the sample. (Knapp-USGS)
W71-07002

AREAL SORTING OF BED-LOAD MATERIAL: THE HYPOTHESIS OF VELOCITY REVERSAL,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
Edward A. Keller.
Geological Society of America Bulletin, Vol 82, No 3, p 753-756, March 1971. 4 p, 1 fig, 5 ref.

Descriptors: *Sediment transport, *Bed load, *Alluvial channels, *Particle size, *Channel morphology, Sedimentation, Bottom sediments, Deposition (Sediments), Streamflow, State-discharge relations, Current meters, California, Velocity.
Identifiers: *Sorting (Sedimentation).

The hypothesis of velocity reversal seems adequate to explain the areal sorting of channel material, that is, relatively large material in riffles and finer material in pools. The hypothesis is based primarily on the observation that with increasing discharge the average bottom velocity of a pool increases faster than that of a riffle until at relatively high flow the average bottom velocity of the pool exceeds that of a riffle. The areal sorting produced by the velocity reversal occurs at flows of moderate frequency. (Knapp-USGS)
W71-07009

GEOMORPHOLOGY OF THE FILDES PENINSULA ON KING GEORGE (WATERLOO) ISLAND,
USSR Arctic and Antarctic Scientific Research Inst., Leningrad, Dept. of Geographical Sciences.
V. V. Zamoruyev.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 71, p 36, 1968. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 3, p 197-198, January 1971. 2 p, 2 ref.

Descriptors: *Geomorphology, *Antarctic, Erosion, Topography, Lakes, Streams, Infiltration, Scour, Glaciers, Solifluction, Mass wasting, Polar regions, Cold regions.
Identifiers: *Fildes Peninsula (Antarctica), *Antarctica.

The Fildes Peninsula is the southwestern tip of Waterloo Island in the South Shetland Island group. The peninsula extends 10 km from the southwest to the northeast and is 2.5-3 km wide. The coastline is dissected by numerous inlets and capes, the most important of which is Ardley Peninsula on the east coast. Most of Fildes Peninsula is free of ice and it does not differ essentially from the 'oases' on the Antarctic continent. The edge of the ice dome, covering Waterloo Island, crosses the northern part of Fildes Peninsula. The ice-free part of Fildes Peninsula is hilly with absolute elevations of up to 150 m. The configurations of large relief forms are probably determined by fractures and tectonically weakened zones. Small lakes, found in the depressions between hills, total 13. The largest of these measures 500 x 250 m. According to preliminary data, the depth of many lakes is at least 5-7 m. The present leading relief-forming processes are physical weathering and solifluction. The drainage network is poorly developed. Because of slow and irregular snow melting and the nature of the loose deposits, most of the water does not form streams, but saturates the accumulations of weathering products and promotes the development of solifluction. The existing streamlets are small and their channels are entrenched only several tens of centimeters. They frequently lack a permanent channel and develop in the form of many small rivulets flowing along the

foot of the solifluction trains. Sometimes, the small streams disappear in the solifluction deposits. Traces of a sea level higher than that now existing occur in many coastal areas. (Knapp-USGS)
W71-07013

CONTINENTAL SABKHA IN ARAVA VALLEY BETWEEN DEAD SEA AND RED SEA: SIGNIFICANCE FOR ORIGIN OF EVAPORITES,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology.
Abraham J. Amiel, and Gerald M. Friedman.
The American Association of Petroleum Geologists Bulletin, Vol 55, No 4, p 581-592, April 1971. 12 p, 12 fig, 3 tab, 35 ref.

Descriptors: *Sedimentation, *Deserts, *Salt marshes, *Saline lakes, *Water chemistry, Evaporation, Groundwater movement, Gypsum, Carbonates, Sulfates, Chemical precipitation, Salts, Chlorides, Stratigraphy, Alluvium, Seepage, Water table.
Identifiers: *Sinai Peninsula, *Sabkhas, *Evaporites.

The Yotvata Sabkha, a continental sabkha having an area of 45 sq km, fills the entire Arava Valley, in the Sinai Peninsula. The climate is one of the most arid in the world. Short, ephemeral streams (wadis), prevented by alluvial fans from reaching the Gulf of Aqaba, provide water that seeps into the soil, thus keeping the water table close to the surface. The capillary fringe above this water table is at the floor of the sabkha. Three distinct zones exist in the sabkha: (1) the central barren zone, (2) the transitional zone, and (3) the outer vegetated zone with halophytic vegetation. Depths to groundwater range from 90 cm in the central barren zone to more than 3 m in the outer vegetated zone. Chlorinity values in the groundwater are highest in the central barren zone (up to 20%) and decrease toward the transitional and outer vegetated zones (1%); a sharp drop occurs near the contact between the central barren zone and transitional zone. The sulfate concentration in the groundwater is greatest in the transitional zone and decreases both toward the central barren zone and the outer vegetated zone. The Mg/Ca ratio of the groundwater parallels the trend in the sulfate concentration. Gypsum is the principal authigenic mineral in the transitional and outer vegetated zones, whereas halite predominates in the central barren zone. (Knapp-USGS)
W71-07024

RECOGNITION OF BARRIER ENVIRONMENTS,
Missouri Univ., Columbia; and Southern Illinois Univ., Carbondale; and Texas A and M Univ., College Station. Dept. of Geology.
David K. Davies, Frank G. Ethridge, and Robert R. Berg.
The American Association of Petroleum Geologists Bulletin, Vol 55, No 4, p 550-565, April 1971. 16 p, 15 fig, 3 tab, 32 ref.

Descriptors: *Sedimentation, *Beaches, *Sand bars, *Dunes, *Sedimentary structures, Geomorphology, Waves (Water), Deposition (Sediments), Shoals, Coasts, Sands.
Identifiers: *Coastal barriers.

The vertical succession of sedimentary structures and textures at Galveston Barrier Island, Texas, is identical with vertical successions in two ancient barrier complexes, one in the lower Cretaceous of Montana and the other in the Lower Jurassic of England. Within both Holocene and ancient examples, there is a gradation upward from irregular interlaminations of siltstone and claystone at the base, through burrowed and generally structureless sandstone, to low-angle and microtrough cross-laminated sandstone, terminating (in two of the examples) in structureless and rooted sandstone. This sequence represents deposition in lower shoreface, middle shoreface, upper shoreface-beach, and eolian environments, respectively. Analyses of quartz size and content of the Holocene and ancient barriers yield textural and compositional parameters that are environmentally sensitive. Plots of these parameters demonstrate that each of the environments may be distinguished on the basis of thin-section analyses. Consequently, full diameter cores may not be necessary for precise environmental interpretation in the subsurface. (Knapp-USGS)
W71-07025

MEASUREMENT OF SHEAR STRESS AND ROUGHNESS LENGTH ON A BEACH,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
Shih-Ang Hsu.
Journal of Geophysical Research, Vol 76, No 12, p 2880-2885, April 20, 1971. 6 p, 4 fig, 2 tab, 18 ref. ONR Contract N00014-69-A-0211-0003, NR 388 002.

Descriptors: *Beaches, *Dunes, *Roughness coefficient, *Shear drag, *Winds, Wind erosion, Aeolian soils, Wind pressure, Air-earth interfaces, Boundary processes, Flow resistance, Shear, Surfaces.
Identifiers: Roughness (Aerodynamic).

Measurements of surface shearing stress and aerodynamic roughness length on a beach were made by simultaneous temperature- and wind-profile methods in the following three areas of the beach slope on the Gulf of Mexico coast near Fort Walton Beach, Florida: the swash zone, the mid-foreshore, and the area near the berm scarp. Under adiabatic and onshore wind conditions, the swash zone is approximately 100 times smoother than the mid-foreshore and 500 times smoother than the area near the berm scarp; the shear stress is approximately 2.5 and 3.5 times larger at 10 m and 20 m fetch downwind, respectively, from the swash zone. (Knapp-USGS)
W71-07028

A TIME SERIES FROM THE BEACH ENVIRONMENT - II,
Virginia Inst. of Marine Science, Gloucester Point.
W. Harrison, and L. E. Fausak.
Virginia Institute of Marine Science Data Report No 7, December 1970. 96 p, 4 fig, 1 tab, 15 ref, 6 append. ONR Contract Nonr-N00014-70-C-000A. ONR Task No NR 388-097.

Descriptors: *Beaches, *Environmental effects, *Time series analysis, *Coasts, *Virginia, Ocean waves, Marine geology, Water table, Elevation, Tides, Rainfall, Pressure, Water levels, Water wells, Oceans, Shores, Slopes, Mathematical studies, Hydrologic data, Data collections, Groundwater, Bedrock, Geomorphology, Erosion.
Identifiers: *Virginia Beach.

Beach variables were sampled during a 30-day period in August and September, 1969, at Virginia Beach, Virginia. The purpose was to investigate the water table of a marine beach and to clarify the interaction of the water table and several process variables of the beach-ocean-atmosphere system. This report describes the methods of measurement and tabulates the values obtained for the following variables: breaker height, breaker period, trough-to-bottom depth in front of a breaking wave, breaker steepness, breaker power, the limit of swash run-up, the outcrop of the water table on the foreshore, slope of the foreshore, water table elevation, beach elevation, barometric pressure, rainfall, and still-water level. (Woodard-USGS)
W71-07047

FLORIDA BEACHES AND CEMENTED WATER-TABLE ROCKS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
Richard J. Russell.
Louisiana State University Coastal Studies Institute Technical Report 88, October 30, 1970. 53 p, 2 fig, 31 photo, 6 tab, 44 ref. ONR Contract N00014-69-A-0211-0003. Project NR 388 002.

Descriptors: *Diagnesis, *Chemical precipitation, *Marine geology, *Beaches, *Florida, Water tables, Rock properties, Cohesion, Atlantic Ocean, Gulf of Mexico, Coasts, Geology, Mineralogy, Stratigraphy.
Identifiers: *Beach rock cementation, *Florida Keys.

In October 1969 Florida beaches between Cedar Key and Dry Tortugas, on the coast of the Gulf of Mexico, and beaches along the Atlantic Ocean as far north as Anastasia Island (St. Augustine), were investigated in a reconnaissance study of composition and indications of cementation associated with their water tables. In all cases cementation was restricted to the zone of water-table fluctuation. There is excellent beach rock on Loggerhead Key (Dry Tortugas) and on Middle Cape (Cape Sable), good beach rock on East Cape (Cape Sable), and water-table rock on Grassy Key (east of Marathon). Other occurrences probably exist south of a line extending from the mouth of Shark River to the coast somewhat south of Homestead. Reported localities farther north on the Atlantic Coast, most of which are given in terms of generalizations, appear to be misidentifications resulting from confusion with outcrops of the Anastasia formation, many of which are in positions where beach rock might be suspected. (Woodard-USGS)
W71-07049

2K. Chemical Processes

TRITIUM LOSS FROM WATER EXPOSED TO THE ATMOSPHERE,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
J. Henry Horton, John C. Corey, and Richard M. Wallace.
Environmental Science and Technology, Vol 5, No 4, p 338-343, April 1971. 6 p, 10 fig, 1 tab, 7 ref.

Descriptors: *Tritium, *Evaporation, *Surface waters, *Atmosphere, Laboratory tests, Mathematical studies, Equations, Streamflow, Watersheds (Basins), Meteorology, Air-water interfaces.
Identifiers: *Tritium loss.

Equations describing the loss of tritium as HTO from water into air and the gain of HTO in water when the overlying water vapor contains tritium but the solution does not are developed and verified by laboratory experiments. Results show that under environmental conditions, where the relative humidity is greater than 8%, HTO is lost preferentially over H2O to the atmosphere because atmospheric moisture is virtually free of HTO. Results from a three-year study of the changes in tritium content of a large nonseeping outdoor basin are used to extend the laboratory studies to field situations. Data from this field study were used to calculate tritium loss from open basins. These calculations show that 90% of the tritium contained in an aqueous stream flowing at 15,000 liters per day will be lost to the atmosphere from a shallow basin with a surface area of 6000 square m. (Woodard-USGS)
W71-06456

ATMOSPHERIC TECHNETIUM-99,
East Texas State Univ., Commerce. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W71-06457

ALKALINE SCALE ABATEMENT BY CARBON DIOXIDE INJECTION,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 03A.
W71-06458

ADSORPTION,
American Chemical Society, Washington, D.C.
For primary bibliographic entry see Field 02D.
W71-06463

GEOCHEMICAL AND GEOLOGICAL RECONNAISSANCE IN THE SEVENTYMILE RIVER AREA, ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W71-06466

THEORETICAL MODEL FOR MANGANESE DISTRIBUTION IN CALCAREOUS SEDIMENT CORES,
Institut de Physique du Globe, Paris (France).
For primary bibliographic entry see Field 02J.
W71-06468

FORMATION OF ANTARCTIC BOTTOM WATER IN THE WEDDELL SEA,
Coast Guard, Washington, D.C. Oceanographic Unit.
For primary bibliographic entry see Field 02C.
W71-06469

SUMMARY OF DATA ON CHEMICAL QUALITY OF STREAMS OF NORTH CAROLINA, 1943-1967,
Geological Survey, Washington, D.C.
Hugh B. Wilder, and Larry J. Slack.
Available from SOD, Washington, DC 20402 - $1.75. Geological Survey Water-Supply Paper 1895-B, 1971. 236 p, 2 plate, 6 tab.

Descriptors: *Water quality, *Chemical analysis, *Surface waters, *North Carolina, Streams, Reviews, Water chemistry, Sampling, Data collections, Water analysis.
Identifiers: *Water analyses compilation.

This report summarizes water-quality data collected by the U.S. Geological Survey in cooperation with the State of North Carolina during the period 1943-67. Maximum, minimum, and average values are shown for chemical analyses of mineral constituents dissolved in water from 177 locations at which samples were collected daily or monthly for at least 1 consecutive year. Maximum and minimum values are given for 460 'miscellaneous and occasional stations' at which two or more samples were collected. Also tabulated are analyses of samples from 580 sites at which only one sample for each site was collected. A total of about 19,000 analyses were used in determining statistical values included in the report. Water in streams of North Carolina is generally of good mineral quality and is acceptable with a minimum amount of treatment for most uses. (Woodard-USGS)
W71-06489

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, LEG 4,
Woods Hole Oceanographic Institution, Mass.; Geological Survey, Woods Hole, Mass.; and California State Coll., Long Beach.
F. L. Sayles, F. T. Manheim, and K. M. Chan.
In: Initial Report of the Deep Sea Drilling Project, Vol 4, National Science Foundation, p 401-414, September 1970; Washington, DC, US Government Printing Office. 14 p, 4 tab, 14 ref.

Descriptors: *Diagenesis, *Water chemistry, *Sediments, *Cores, *Connate water, Sampling, Sedimentation, Data collections, Laboratory techniques, On-site tests, Salinity.
Identifiers: Interstitial water.

Reorganization and recodification of shipboard procedures used in the Deep Sea Drilling Project for collecting interstitial waters result in improved and more regular collection and analysis of pore fluids. Comparative studies of waters squeezed and analyzed on shipboard and analyzed in the shore laboratory show generally good agreement. Influences of pressure and temperature during squeezing on composition of effluents were studied in clayey sample cores. Pressure was not found to be significant, whereas the temperature effects are significant, but are less than variations attributable to diagenetic reactions in the sediments. Conservative constituents, such as, chloride, sodium and bromide, remain relatively constant (within about 1.5%) with changing depth in the holes; but, large depletions with respect to normal sea water occur in calcium, magnesium, potassium, and sulfate in most of the cores. On the other hand, large enrichments of calcium and lithium occurred in some holes. (Knapp-USGS)
W71-06497

DETERMINATION OF CARBONATE SATURATION OF SEAWATER WITH A CARBONATE SATUROMETER,
California Univ., Los Angeles, Dept. of Geology; and California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 07B.
W71-06513

RADIOCHEMICAL ANALYSES OF WATER FROM WELLS, SPRINGS, AND STREAMS IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-06669

RECONNAISSANCE OF SELECTED MINOR ELEMENTS IN SURFACE WATERS OF THE UNITED STATES, OCTOBER 1970,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-06670

A UNIQUE RESULT OF MOSSBAUER SPECTROSCOPY,
Technical Publishing Co., Barrington, Ill. Thompson Div.
F. W. Karasek.
Research/Development, Vol 22, No 3, p 18-20, 22, March 1971. 4 p, 6 fig, 1 photo, 4 ref.

Descriptors: *Water pollution control, *Synthesis, *Instrumentation, *Spectroscopy, Chemical degradation, Fertilizer, Nutrients, Water quality, Wastes, Pollutants, Water chemistry, Herbicides
Identifiers: *Water degradable products, *Polymers, *Mossbauer spectroscopy.

Over 100 important commercial compounds have been polymerized with metals such as iron, copper and calcium to form water-degradable products. This report describes the functions of Mossbauer spectroscopy concerning the chemical bonding and structures involved. The value of these polymers for increasing the effectiveness of agricultural chemicals and reducing environmental pollution appears considerable. Initial emphasis has been placed on herbicidal uses. Pollution of water supplies commonly accompanies the application of herbicides in useful concentrations. Rain or irrigation water washes away much of the herbicide; hence overapplication is required for effective control, with several applications a year needed. A 2,4-D-iron polymer with a single application of 1 pound/acre has effectively controlled weeds on grazing lands in Kansas for over one year. Other tests show effectiveness in aquatic herbicidal use. (Woodard-USGS)
W71-06672

THE EFFECT OF METEORIC WATER, MELT WATER AND BRINE ON THE COMPOSITION OF POLAR SEA WATER AND OF THE DEEP WATERS OF THE OCEAN,
Woods Hole Oceanographic Inst., Woods Hole, Mass; and Geological Survey, Washington, D.C.
Alfred C. Redfield, and Irving Friedman.
Deep-Sea Research, Supplement to Vol 16, p 197-214, Pergamon Press, 1969. 18 p, 11 fig, 3 tab, 17 ref.

Descriptors: *Salinity, *Sea water, *Deuterium, *Melt water, *Arctic Ocean, Glaciers, Arctic, Water properties, Mixing, Brines, Rain water.
Identifiers: *Baffin Bay.

The fresh water derived from melting sea ice may be distinguished from that derived from meteoric waters by its deuterium content. The apparent diluent of the Arctic Ocean waters has a deuterium content of about - 25% relative to Standard Mean Ocean Water, corresponding to the average composition of meteoric water, snow and glacial ice in the polar regions. The melt water from sea ice has very nearly the same deuterium content as the sea water from which it is frozen. In summer the subsurface layers of sea water in regions where ice is formed and melted seasonally differ very little in deuterium content although the salinity is reduced substantially by melt water. In confined straits and fiords the apparent diluent is derived about 3/4 from glacial ice and 1/4 from melting sea ice. It is estimated from deuterium-salinity relations that brine liberated in the freezing of sea ice increases the salinity of the subsurface water of Baffin Bay at 100 m by 0.36 parts per thousand and that of the water near the bottom of Kane Basin by 0.6 parts per thousand. The freezing of 2 meters of sea ice would be sufficient to liberate the quantity of salt required to produce these changes in salinity. Comparison of the deuterium and salinity concentrations in the deep water masses of the ocean with those of their presumed sources indicates that salt liberated as brine in the freezing of sea ice may increase the salinity by 0.02 to 0.16 parts per thousand over that which the deep water would have were it modified solely by dilution with polar meteoric water. The consequence of this effect in seeking the source of deep water is discussed. (Knapp-USGS)
W71-06688

CASE-HARDENING OF CARBONATE ALLUVIUM AND COLLUVIUM, SPRING MOUNTAINS, NEVADA,
Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02J.
W71-06996

CHEMISTRY OF WATER, ICE, AND SNOW IN THE SCHIRMACHER PONDS,
Arkticheskii i Antarkticheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02H.
W71-07019

METHODS FOR COLLECTION AND ANALYSIS OF WATER SAMPLES FOR DISSOLVED MINERALS AND GASES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 01A.
W71-07032

SEASONAL VARIATIONS, SULPHUR MOUNTAIN HOT SPRINGS, BANFF, ALBERTA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02F.
W71-07036

DETERMINATION OF SOME CHEMICAL AND PHYSICAL RELATIONSHIPS FROM RECORDING METERS IN LAKES,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05A.
W71-07045

A COLORIMETRIC METHOD FOR AMMONIA IN NATURAL WATERS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
For primary bibliographic entry see Field 05A.
W71-07046

2L. Estuaries

DIELDRIN AND ENDRIN CONCENTRATIONS IN A LOUISIANA ESTUARY,
Ogden Coll. of Science and Technology, Bowling Green, Ky, and Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science; and Franklin Inst., Boston, Mass; and Riverside Research Labs., La Chasse, La.
For primary bibliographic entry see Field 05B.
W71-06460

MORPHOLOGY AND QUATERNARY HISTORY OF THE CONTINENTAL SHELF OF THE GULF COAST OF THE UNITED STATES,
Office of Naval Research, Boston, Mass.; and Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W71-06493

THE EFFECTS OF THERMAL LOADING AND WATER QUALITY ON ESTUARINE PRIMARY PRODUCTION,
Maryland Univ., Solomons. Natural Resources Inst.
For primary bibliographic entry see Field 05C.
W71-06595

WATER QUALITY AT PATUXENT RIVER BRIDGE, MARYLAND - JANUARY 1968 THROUGH NOVEMBER 1969,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 05A.
W71-06664

SURFACE SALINITY ALONG THE EAST COAST OF THE UNITED STATES,
Woods Hole Oceanographic Institution, Mass.
Joseph Chase.
Deep-Sea Research, Supplement to Vol 16, p 25-29, Pergamon Press, 1969. 5 p, 2 fig, 8 ref. Fish and Wildlife Service Contract No 14-17-0007-918.

Descriptors: *Salinity, *Sea water, *Atlantic Ocean, *Streamflow, *Coasts, United States, Mixing, Seasonal, Runoff, Rainfall, Water chemistry, Sampling, Data collections.
Identifiers: U. S. East Coast.

The annual cycle of surface salinity at twelve locations off the east coast of the United States is discussed and related to the discharge and the proximity of rivers. The comparatively large ranges observed at the season of lowest salinity result largely from year to year variation in the time of the minimum and in the strength of the maximum river discharge. Generally the range is smaller in the early months of the year when the watersheds are frozen than in the late months before freezing is complete. (Knapp-USGS)
W71-06687

RADIOACTIVE CESIUM IN ESTUARIES,
Naval Ordnance Lab., Silver Spring, Md. Nuclear Physics Div.
For primary bibliographic entry see Field 05B.
W71-06702

ECONOMIC ASPECTS OF OCEAN ACTIVITIES. VOLUME II. ECONOMIC FACTORS IN THE DEVELOPMENT OF A COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 06B.
W71-06776

LONG TERM CHANGES IN MARINE ECOSYSTEM: ECOLOGICAL RELATIONSHIPS BETWEEN TOMALES BAY AND ADJACENT SHELF WATERS,
Pacific Marine Station, Dillon Beach, Calif.
Stanley J. Marcus, and Roy S. Houston.
Available from NTIS as AD-714 233, $3.00 in paper copy, $0.95 in microfiche. Pacific Marine Station Special Scientific Report No 7, July 1970. 45 p, tables.

Descriptors: *Plankton, *Ecology, Ocean circulation, *Ocean currents, Temperature, Salinity, *Sea water, Hydrography, Continental shelf, Pacific ocean, Oceanography.
Identifiers: *Marine biology, Marine meteorology, California, Tomales Bay, Upwelling, Black Swan vessel, Sea state.

Progress during the past year was primarily in the development of an offshore measurement capability and the initial stage of data collection in the region adjacent to Tomales Bay. Preliminary analysis indicates that several cycles of coastal upwelling having a period of five to six weeks, were observed by sequential measurements during the fall and winter months of 1969-1970. A low-cost operational capability has been achieved for the study of detailed density structure of shelf waters. Results not only provide some understanding of the processes affecting Tomales Bay, but indicate a possible relationship of the density structure to be movements of commercially important fish in the area.
W71-06799

A NUMERICAL INVESTIGATION OF TIDAL CURRENT CIRCULATION IN THE GULF OF MAINE,
Naval Postgraduate School, Monterey, Calif.
Arthur Paul Drenna.
Available from NTIS as AD-714 612, $3.00 in paper copy, $0.95 in microfiche. Thesis, MS in Oceanography, Naval Post Graduate School, Oct 1970. 69 p.

Descriptors: *Tides, *Mathematical models, *Ocean currents, *Wind tides, Waves.
Identifiers: *Main Gulf, Tidal height.

The hydrodynamical-numerical model of Walter Hansen is used to compute tidal heights and tidal currents in the Gulf of Maine. The model uses two adjacent open boundaries at which the tides are prescribed at each time step, using four tidal constituents. The grid size is six nautical miles and the time step is thirty-one seconds. Seven data runs are reported; one uses the tides and no wind and the remaining six use uniform wind fields in consort with the tides. A modified method of handling the topographic data is used. The pertinent results of the study are: (1) the use of Hansen's Model with adjacent open boundaries produces broad subjective agreement with observed data, (2) the modified method of handling topographic input data is workable, (3) wind direction and velocity produce slight variations in tidal height, (4) wind direction and velocity modify the direction of the tidal currents considerably and produce some significant increases in tidal current speed, and (5) the modifying influences of wind fields on tidal heights, tidal current velocities, and tidal current directions are more noticeable in shallow water areas than in regions of deep water.
W71-06801

SHALLOW STRUCTURAL CHARACTERISTICS OF FLORIDA ATLANTIC SHELF AS REVEALED BY SEISMIC RELFLECTION PROFILES,
Army Coastal Engineering Research Center, Washington, D.C.
Edward P. Meisburger, and David B. Duane.
Available from NTIS as AD-702 003, $3.00 in paper copy, $0.95 in microfiche. Transactions, Gulf Coast Association of Geological societies, Vol 19, p 207-215, 1969.

Descriptors: *Continental shelf, *Seismic waves, *Sands, *Erosion, Florida.
Identifiers: Seismic reflection profiles, Sand resources.

A sand resources survey off eastern Florida in 1965-66 by CERC resulted in the collection of 2,600 miles of seismic reflection profiles. With a penetration depth range of 0 to -500 feet MLW the profiles extend from nearshore (approximately 15-foot depth) to 15 miles offshore. The records show several prominent acoustic reflecting horizons at shallow depth which can be traced over large areas of the nearshore shelf. These areally extensive reflectors indicate some shallow structural features beneath the shelf surface; tentative stratigraphic correlations have been made in some cases with logged wells onshore. In CERC reflection records, the dominant structural feature is an almost universal eastward dip of strata. Subbottom acoustic horizons on the records are judged to represent a stratigraphic range from Eocene to Recent. Erosional surfaces and shallow water bedform features in the uppermost section are interpreted as resulting from Pleistocene sea level fluctuations.
W71-06928

RECENT SEDIMENTS OF BOLINAS BAY, CALIFORNIA. PART C. INTERPRETATION AND SUMMARY OF RESULTS,
California Univ., Berkeley. Hydraulic Engineering Lab.
P. Wilde, C. Isselhardt, L. Osuch, and T. Yancey.
Available from NTIS as AD-704 694, $3.00 in paper copy, $0.95 in microfiche. Technical Report HEL-2-23, December 1969. 86 p.

Descriptors: *Sedimentation, *Continental shelf, *Petrography.
Identifiers: *Heavy minerals, Bolinas Bay (Calif).

Samples of marine sediments and shore rocks from Bolinas Bay, California, were analyzed for grain size and heavy mineral content. This work, part of a study of sediment transport off Central California, indicates: (1) heavy mineral assemblage is predominantly green hornblende with secondary amounts of hypersthene and augite. Nearshore glaucophane and jadeite occur in locally high concentrations. (2) Distribution pattern of the heavy minerals shows a tongue of high concentrations of minerals that have a granitic source extending northwest from the San Francisco Bay, flanked on the north and northeast by increasing landward concentrations of Franciscan metamorphic minerals. (3) The major source of heavy minerals is the San Francisco Bay. Secondary contributions come from Bolinas Lagoon and the adjacent cliffs. (4) Circulation in the bay is primarily counterclockwise; produced by a combination of wave refraction around Duxbury Reef and the tidal coast eddy current. Tidal influence, however, of Bolinas Lagoon is restricted to about 1 mile from the lagoon mouth. Circulation patterns in the bay greatly influence sediment distribution. (5) Annual sediment flux in Bolinas Bay is about 300,000 cubic yards; bottom sediments are apparently in quasi-equilibrium.
W71-06929

MOLECULAR PHYSICS OF THE SEA, PART VIII,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-06938

TRACING SAND MOVEMENT IN THE LITTORAL ZONE: PROGRESS IN THE RADIOISOTOPIC SAND TRACER (RIST) STUDY, JULY 1968-FEBRUARY 1969,
Army Coastal Engineering Research Center, Washington, D.C.
David B. Duane.
Available from NTIS as AD-713 001, $3.00 in paper copy, $0.95 in microfiche. Corps of Engineers Miscellaneous Paper No 4-70, August 1970. 52 p, 25 fig, 1 tab, 25 ref.

Identifiers: *Seacoast (Sand), *Sand (Tracer studies), Transport properties, Labeled substances, Radioactive isotopes, Xenon, Radiation measurement systems, Cesium compounds, Sedimentation, Gold, Tides, Beaches, California, *RIST (Radioisotopic Sand Tracer Study), *Radioisotopic sand tracer study, Littoral zone, *Sediment transport.

Tagging procedures, instrumentation, field surveys and data handling techniques have been developed by the radioisotopic sand tracing study for the collection and analysis of over 12,000 bits of information per hour over a survey track of about 18,000 feet. Data obtained can be considered as nearly synoptic observations of sediment transport in a single environmental zone or in adjacent beach, surf and offshore zones. Experiments at Surf, Point Conception, Point Mugu, and Oceanside, California, used sand tagged with isotopes of xenon or gold. Data from studies in beach areas unmodified by littoral barriers indicate that the alongshore velocity of sediment transport differs from zone to zone. Transport seaward of peaking, breaking waves is less than transport on the beach face which is less than transport in the plunge and surf zone. Zone dimensions change with waves and tides. Tracing surveys confined to the foreshore of offshore zones produce data only partly indicative of transport in the zone of immediate concern to coastal engineers. Studies conducted at the site of shore structures indicate the RIST system can provide data useful in understanding the effect of such structures on sediment transport.
W71-06941

SOURCE AND MIXING OF INSOLUBLE CLAY MINERALS IN A SHALLOW WATER CARBONATE ENVIRONMENT - FLORIDA BAY,
University of South Florida, Tampa. Dept. of Geology.
J. P. Manker, and George M. Griffin.
Journal of Sedimentary Petrology, Vol 41, No 1, p 302-306, March 1971. 5 p, 3 fig, 12 ref.

Descriptors: *Bottom sediments, *Provenance, *Sediment transport, *Suspended load, *Clay minerals, Deposition (Sediments), Mud, Marl, Currents (Water), Tides, Tidal effects.
Identifiers: *Florida Bay.

Chlorite and smectite dominate the clay-size insoluble residue of Recent carbonate sediments of Florida Bay. Illite and kaolinite also occur in very small quantities. Chlorite is derived from the Atlantic Coast and eastern Everglades provinces and is introduced by streams and by tidal channels through the northern Florida Keys. Smectite is derived from the Gulf of Mexico province to the west. In the northern part of Florida Bay, water flow is greatly impeded by a complex bank and basin system, and the clay mineral suites remain relatively segregated near their respective sources. However, in the southern part of the bay, banks are less frequent, water flow is less impeded, and the clay mineral suites mix gradually across the area. (Knapp-USGS)
W71-06997

RELATIONSHIP BETWEEN GRAIN SIZE PARAMETER DISTRIBUTION AND CURRENT PATTERNS IN THE GIRONDE ESTUARY (FRANCE),
Inst. of Gelogie du Bassin d'Aquitaine, Facultes des Sciences, Bordeaux, France.
George P. Allen.
Journal of Sedimentary Petrology, Vol 41, No 1, p 74-88, March 1971. 15 p, 16 fig, 43 ref.

Descriptors: *Sediment transport, *Bed load, *Particle size, *Waves (Water), *Estuaries, Bottom sediments, Currents (Water), Sedimentary structures, Sedimentation, Sedimentary petrology, Statistical methods, Distribution patterns.
Identifiers: Gironde Estuary (France).

The bottom sediments in the marine portion of the Gironde estuary were sampled and studied in relationship to the local wave and tidal current patterns. A semi-empirical analysis was conducted to delimit the areas of wave refraction and the bottom orbital velocity variations. Compilation of the current and wave energy data from on-site measurements show that distinct energy zones exist, each characterized by different current strength and type. These zones are controlled by the morphological features of the estuary, the tidal and wave energy zones being mutually exclusive. Most of the tidal current discharge occurs in the deeper channels, whereas the shoal areas are the site of important wave energy. Most of the sediments are sands (phi means between 2.0 and 0.5). A large gravel deposit, however, was observed at the entrance of the estuary. The textural parameter distribution patterns of the sands coincide with and reflect the different energy zones. The gravel deposit is inferred to be a fossil alluvial terrace because it does not seem to be in accord with the present-day current patterns. The inferred transportational processes reflect the established energy zones. A CM curve analysis indicates a graded suspension transport mode for zones where wave energy predominates, and bed-load transport for areas influenced by tidal currents. This effect seems to be corroborated by consideration of the orbital bottom wave velocity as a function of depth. The depth limit for the transporational processes due to wave activity seems to be about 15 meters. Beyond this depth, the sediment is transported mainly by the tidal currents. (Knapp-USGS)
W71-07001

ON THE MANAGEMENT OF GROUNDWATER IN COASTAL AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04B.
W71-07005

THE INFLUENCE OF DECOMPOSING SALMON ON WATER CHEMISTRY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W71-07057

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ALKALINE SCALE ABATEMENT BY CARBON DIOXIDE INJECTION,
California Univ., Los Angeles. School of Engineering and Applied Science.
Ronald D. Ellis, Julius Glater, and Joseph W. McCutchan.
Environmental Science and Technology, Vol 5, No 4, p 350-356, April 1971. 7 p, 8 fig, 3 tab, 23 ref.

Descriptors: *Scaling, *Desalination, *Abatement, *Carbon dioxide, Injection, Alkaline water, Magnesium hydroxide, Calcium carbonate, Heat transfer, Temperature, Methodology, Sea water.

Distillation of untreated seawater results in precipitation of alkaline scaling compounds (calcium carbonate and magnesium hydroxide) on heat transfer surfaces. Scale deposition was successfully eleminated by continuous injection of carbon dioxide. Threshold levels for scale control increase with distilling temperature and range from 37 ppm at 255 deg F to 64 ppm at 284 deg F. Profiles of carbon dioxide concentration, pH, and scale composition were studied over a wide temperature range. Special techniques were developed for injection of carbon dioxide and monitoring the concentration in a pressured system. Methods were also determined for collection and analysis of scale deposits. Carbon dioxide injection offers advantages over acid injection or polyphosphate-based additives which are currently used for controlling alkaline scale. (Woodard-USGS)
W71-06458

CONCERNING THE ECONOMIC VALUE OF EXPERIMENTATION IN THE DESIGN OF DESALTING PLANTS,
Department of Commerce, Washington, D.C.
Myron Tribus, and Jacques P. Pezier.
Desalination, Vol 8, No 3, p 311-349, December 1970. 39 p, 8 fig, 6 tab, 13 ref, 2 append.

Descriptors: *Desalination plants, *Design, *Economics, *Decision making, *Optimization, *Statistical methods, Costs, Numerical analysis.
Identifiers: *Utility function, Experimentation.

This paper was concerned with the analysis of the economic worth of design data gathering, that is, the determination of the various coefficients and design parameters which cannot be computed from prior experience or from first principles, for design of desalting plants. In the analysis techniques known under the general title 'Decision Analysis' were used and the Kelvin objective function was shown to represent the balance between capital costs and operating costs for most desalting plants. For the purposes of this paper all costs and income were reduced to present values. Since in practice the designer doesn't know the precise values of the variables the concern here was with the expected value of information computed by the designer before the experiment is undertaken. In the field of Decision Analysis risk preference or aversion is treated by describing a utility function for the decision maker. Two cases of interest, Case 1A: the utility of money equal to its face value and the plant must be built, and Case 2A: the plant is to be built anyway and the utility of money is non-linear were described in detail including equations, examples, experiments and computer programs. A numerical example which considered a plant for which prior expected values were known was illustrated. It was concluded that it is extremely important to determine the exact circumstances under which a system is to be optimized in order to infer the value of information about design of an experiment. (Kriss-Cornell)
W71-06590

3B. Water Yield Improvement

WILDLIFE VERSUS IRRIGATION,
Science Service, Washington, D.C.
Richard H. Gilluly.
Science News, Vol 99, No 11, p 184-185, March 13, 1971. 2 p, 2 fig.

Descriptors: *Vegetation effects, *Defoliants, *Irrigation, *Wildlife, *Arizona, Reviews, Evaluation, Streams, Banks, Phreatophytes, Water yield, Evapotranspiration.
Identifiers: *Phreatophyte removal controversy.

In Arizona, Federal agencies are studying the removal of phreatophytes-deep-rooted vegetation--from the banks of many rivers in the state. The main purpose of the removal is to conserve water in that arid state. The phreatophytes, stress the advocates of removal, absorb water from the water table and release it to the air through evapotranspiration. Removal of the plants from waterways, they say, will make more water available for downstream irrigation. Bitterly opposing the phreatophyte removal projects, are conservationists and wildlife proponents who say that the riverbank vegetation is the only major wildlife habitat in the arid state. Remove it, they say, and the adverse effects on wildlife will be devastating and sometimes irreversible. Other arguments raging around the phreatophyte removal proposals are discussed. (Woodard-USGS)
W71-06465

PHREATOPHYTES - A BIBLIOGRAPHY.
Water Resources Scientific Information Center, Washington, D.C.

Available from NTIS as PB-198 305, $3.00 in paper copy, $0.95 in microfiche. Report WRSIC 71-200, April 1971, unpaged.

Descriptors: *Phreatophytes, *Brush control, *Water utilization, *Water yield improvement, Water loss, Weeds, Evaporation, Evapotranspiration, *Bibliographies, Abstracts, Chaparral, Arid lands, Desert plants, Cottonwoods, Mesquite, Sagebrush, Tamarisk, Shrubs.
Identifiers: Shrub control.

This compilation of 122 abstracts is the first in a series of planned bibliographies in water resources to be produced wholly from the information base comprising only SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the time of search for this bibliography, the information base comprised 25,104 abstracts covering SWRA through March 15, 1971 (Volume 4, Number 6). A keyword-in-context (KWIC) index is provided to guide the user to relevant abstracts.
W71-06596

WATER SUPPLY AND DEMAND,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 06D.
W71-06598

WATER WELL HANDBOOK,
Missouri Water Well and Pump Contractors Association, Rolla, Mo.
For primary bibliographic entry see Field 08A.
W71-06919

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Center, Philadelphia, Pennsylvania.

Available from National Technical Information Service as PB-198 433, $3.00 in paper copy, $0.95 in microfiche. Philadelphia, University City Science Institute, March 22, 1971. 132 p, 12 fig, 19 tab, 43 ref. USCI-ES-3.

Descriptors: *Water management (Applied), *Water resources development, Cost-benefit analysis, Technical feasibility, Water supply, Water demand, Reservoirs, Dams, Inter-basin transfer, Artificial recharge, Ecology, Recreation.
Identifiers: *New Castle County, Delaware, Schuylkill River, Susquehanna River.

This study concludes that current water demand exceeds current safe yield in New Castle County, Delaware, that the deficit may increase by 2 to 3 million gallons per day in the near future, and that, from the economic and engineering viewpoints, the proposed White Clay Creek Dam and Reservoir has the greatest prospect of any proposed project for increasing water supply. Previous engineering, economic, and feasibility studies of the water resources and demand projections in the county are reviewed. Aspects discussed include: projected water demand and county needs, an economic analysis of the White Clay Creek Dam and Reservoir proposal, other currently feasible alternatives, groundwater development, a study of the ecological and aesthetic aspects of the reservoir site, and a projection of economic conditions and financing alternatives. Other alternatives discussed include an interbasin transfer from the Schuylkill and Susquehanna Rivers to the White Clay Creek, proposed by the Mason-Dixon Task Force, and a large-scale artificial groundwater recharge project. (Dorr-USSC)
W71-06933

TAKING REPRESENTATIVE FORMATION SAMPLES.
U.O.P., St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W71-06945

INTERPRETATION OF ELECTRIC LOGS IN FRESH WATER WELLS IN UNCONSOLIDATED FORMATIONS,
Schlumberger Well Surveying Corp., Houston, Tex.
R. P. Alger.
Society of Professional Well Log Analysts Symposium, Houston, Texas, 1966. 25 p, 4 tab, 15 fig, 12 ref.

Descriptors: *Borehole geophysics, *Water wells, *Water quality, Resistivity, Bicarbonates, Drilling fluids, Chlorides, Specific conductance, Size, Particle size, Salinity tolerance.
Identifiers: *Specific potential, Salinity-resistivity chart (Fresh water), Divalent cations, Formation resistivity, Total dissolved solids, Grain size, Surface conductance, Size analysis, Sorting evaluation.

Evaluation of wells drilled for fresh water present special problems in log analysis. In such analyses the problem is not to distinguish between two types of fluid, as in the evaluation of oil prospects, but to determine the quality and quantity of water that may be obtained from various strata. In oil field interpretation Rw determination through SP analysis is usually satisfactory. There, the interrelations between concentration, activity, and resistivity are well established because NaCl interrelationship does not apply. The SP is used for determination of fresh water quality, but firm empirical data for the locale are required. Measurements of resistivity provide the means for determining relative productivities of fresh water sands. Unconsolidated sands generally exhibit uniformly high porosities; however, a surface conductance effect in fresh water sands causes the formation resistivity factor to vary with both Rw and grain size. Because permeability is related to grain size, resistivity values indicate relative productivity. (Campbell-NWWA)
W71-06947

WELL POINT SYSTEMS.
U.O.P., St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W71-06948

TESTING WATER WELLS FOR DRAWDOWN AND YIELD.
U.O.P., St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W71-06949

SOURCE WATER WELL DESIGN AND EFFICIENCY,
U.O.P., St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W71-06951

3C. Use of Water of Impaired Quality

THE EFFECT OF SELECTED HYDROLOGIC VARIABLES ON STREAM SALINITY,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 06A.
W71-06588

DESALTING SALINE WATER FOR IRRIGATION--A CASE STUDY--COACHELLA AREA,
Bureau of Reclamation, Boulder City, Nev.
E. S. Krous.
Paper 6th American Water Resources Conferences Conference, Las Vegas, Nevada, October, 1970. 19 p, 8 fig, 4 tab, 15 ref.

Descriptors: *Demineralization, *Saline water, *Agriculture, Salinity, *Irrigation water, Membrane processes, Desalination processes, Water costs, Distillation, Benefit-cost retios, Investment, Crop production, Bibliographies, Brine disposal, Consumptive use (Water), Multistage flash distillation, Operating costs, Water sources, Costs, *Desalination.
Identifiers: *Saline agriculture, Coachella Valley (Calif).

A study was performed to evaluate potential applications of desalted saline water for agriculture using 2 distillation and 2 membrane processes. The investigation determined costs and benefits associated with desalting saline water at concentrations of 1500, 900, 400, 200 and 50 ppm. Benefits from desalting are generated by shifts to more profitable crops, reduced costs for drainage, and reduced fertilizer and labor requirements with better quality water. Costs are based on project features such as desalting plants, raw water diversion facilities, storage reservoirs, conveyance and distribution systems, brine disposal, blending facilities, and gypsum addition systems. Hydrologic studies determined crop irrigation requirements, water demand schedules, desalted water storage requirements, brine disposal requirements, and size of facilities required. Reconnaissance design layouts were made for producing desalted water using a combination of 14 schemes. Benefit-cost ratios range from 0.4 to 1.0 for 1500 ppm irrigation water to 0.8 to 1.0 for 50 and 200 ppm water. Investment costs per acre are high, ranging from $12,900 to $20,900. Irrigation benefits are based on the increase in production from a desert condition with no water supply to the irrigation conditions studied. (USBR)
W71-06833

3D. Conservation in Domestic and Municipal Use

HYDROLOGICAL AND ENVIRONMENTAL CONTROLS ON WATER MANAGEMENT IN AN ARID URBAN AREA,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 04C.
W71-06597

WATER AND RELATED LAND RESOURCES - STATE ADMINISTRATION, LEGISLATIVE PROCESS AND POLICIES IN MINNESOTA, 1970,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 06E.
W71-06599

3E. Conservation in Industry

WATER FOR INDUSTRIAL DEVELOPMENT IN AMITE, FRANKLIN, LINCOLN, PIKE, AND WILKINSON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
Roy Newcome, Jr., and F. H. Thomson.
Mississippi Research and Development Center Report, 1970. 61 p, 20 fig, 12 tab, 20 ref, append.

Descriptors: *Water resources, *Industrial water, *Appraisals, *Planning, *Mississippi, Groundwater, Streamflow, Water quality, Hydrologic data, Geohydrologic units, Artesian wells, Water resources development, Water utilization, Perennial streams.
Identifiers: Amite County, Franklin County, Lincoln County, Pike County, Wilkinson County.

Details are given on availability, chemical quality, and physical characteristics of groundwater and surface water of this five-county area in southwest Mississippi, based on an investigation begun in July 1967. Designed as a planning guide for development and management of water supplies, the report contains 20 illustrations, 12 data tables, and the interpretive text. Five geohydrologic sections in different parts of the area show depth and thickness of aquifers, clayey beds, and the base of fresh water; maps and tables give the DO and low-flow velocities for major streams; and data tables given chemical analyses, streamflow records, well records, and

data on potential supply at selected places. Streams and aquifers have scarcely been tapped for water supplies and present pumpage from wells totals less than 10 mgd. The only significant water problem is excessive iron; most public and industrial water supplies are aerated for iron removal. Sixteen streams in the area can supply 5 mgd each without storage during drought periods; 8 could supply 10 mgd each and 3 streams could supply 100 mgd each. With storage, the Homochitto River could provide 350 mgd and Bogue Chitto 250 mgd in a drought of 10-yr recurrence interval. The 1,300- to 3,000-ft section of Miocene sand and clay contains numerous artesian aquifers of various thicknesses and irregular extent. Only a few wells produce more than 500 gpm, but a great many of the aquifers could support well yields of 2,000 gpm, or more. The groundwater is soft and low in mineralization (usually less than 200 mg per liter). Natural thermal conditions may preclude some uses of surface water for industrial needs. (Lang-USGS)
W71-06510

3F. Conservation in Agriculture

A SIMULATION OF IRRIGATION SYSTEMS--THE EFFECT OF WATER SUPPLY AND OPERATING RULES ON PRODUCTION AND INCOME ON IRRIGATED FARMS,
Economic Research Service, Fort Collins, Colo. Natural Resource Economics Div.
For primary bibliographic entry see Field 06A.
W71-06581

A UNIQUE RESULT OF MOSSBAUER SPECTROSCOPY,
Technical Publishing Co., Barrington, Ill. Thompson Div.
For primary bibliographic entry see Field 02K.
W71-06672

MECHANIZED SURFACE IRRIGATION SYSTEMS FOR ROLLING LANDS,
California Univ., Davis. Dept. of Water Science and Engineering.
William E. Hart, and John Borrelli.
California University Water Resources Center Contribution No 133, June 1970. 93 p, 43 fig, 6 tab, 7 ref, append. Water Resources Center Project UCAL-WRC-70-W-175.

Descriptors: *Irrigation design, *Automation, Irrigation ditches, Irrigation programs, Irrigation systems, Irrigation efficiency, California, Topography, Furrow irrigation, Application equipment, Water distribution (Applied).
Identifiers: *Automatic irrigation equipment, *Sierra Nevada (Calif.).

This report describes, in detail, a surface irrigation system which makes more efficient use of water and labor in the rolling lands of the Sierra Nevada Foothills than do existing systems, and at only a slight increase in capital cost. Design details are included, with some management techniques for the system as applied to irrigated pastures. Much of the information is applicable to other crops. Fully-automatic or semi-automatic check structures allow the irrigator to make several sets at a single visit to a field. A system of outlets retains its settings and is unaffected by animals within the field, ground settlings, or factors other than the level of the water in the supply ditch. A system of corrugations (small furrows) runs downslope from the head or distribution ditches. These corrugations, if properly constructed and maintained, assure that any water properly distributed at the upper edge of the field (by the outlets) will be properly distributed at the lower edge of the field. Upon operation, with no increase in labor, the water application efficiency (usefully applied water divided by total applied water) was increased from about 35 percent to 80 percent. (Knapp-USGS)
W71-07050

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

WILDLIFE VERSUS IRRIGATION,
Science Service, Washington, D.C.
For primary bibliographic entry see Field 03B.
W71-06465

FLOOD PLAIN INFORMATION, NORTH BRANCH PENNSAUKEN CREEK, BURLINGTON COUNTY, NEW JERSEY.
Corps of Engineers, Philadelphia, Pa.

Corps of Engineers Flood Plain Report, December 1970. 49 p, 8 fig, 10 plate, 8 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *New Jersey, Regional flood, Flood forecasting, Flood control, Peak discharge, Rainfall-runoff relationships, Historic flood.
Identifiers: *Burlington County (NJ), Standard project flood, Intermediate regional flood.

Flooding along the North Branch of Pennsauken Creek from its confluence with the South Branch upstream to the New Jersey Turnpike bridge and the Strawbridge Lake tributary from its confluence with North Branch upstream to the New Jersey Route 38 bridge is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest flood known to have occurred in the lower reaches of Pennsauken Creek is the August 1933 flood resulting from tidal flooding on Delaware River. This flood produced stages of 9.0 feet, mean sea level datum at the mouth of Pennsauken Creek and 11.0 feet at the confluence with the South Branch. (Woodard-USGS)
W71-06517

FLOOD PLAIN INFORMATION, BIG COTTON INDIAN, LITTLE COTTON INDIAN, TAR AND PANTHER CREEKS - PART 1. METROPOLITAN ATLANTA, GEORGIA.
Corps of Engineers, Savannah, Ga.

Corps of Engineers Flood Plain Report, January 1971. 44 p, 21 fig, 58 plate, 13 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Georgia, Regional flood, Flood forecasting, Flood control, Historic flood.
Identifiers: *Henry and Clayton Counties (Ga), Standard project flood, Intermediate regional flood.

Flooding in Henry and Clayton Counties, Georgia, along Big Cotton Indian, Little Cotton Indian, Tar, and Panthers Creeks from the mouth of Big Indian Creek on South River to their headwaters is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The storm of December 7-10, 1919 produced the flood of record. Moderate precipitation occurred December 6-8, but on December 8-9 there was 11.8 inches of rainfall recorded at the Atlanta station. Based on information of high water marks on nearby streams, this flood has a frequency of over 100 years. (Woodard-USGS)
W71-06522

STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMUM RESERVOIR OPERATION,
Texas Univ., Austin, Center for Research in Water Resources.
William S. Butcher.
Water Resources Bulletin, Vol 7, No 1, p 115-123, February 1971. 9 p, 3 fig, 12 ref.

Descriptors: *Dynamic programming, *Stochastic processes, *Optimization, Water resources development, *Multiple-purpose reservoirs, Operations, Monthly, Time, Streamflow, Equations.
Identifiers: *Watasheamu Dam.

A study in which an optimal operating policy for a multipurpose reservoir was determined was presented, where the optimal operating policy was stated in terms of the state of the reservoir indicated by the storage volume and the river flow in the preceding month and used a stochastic dynamic programming approach. Watasheamu Dam, a dam proposed to be built by the Bureau of Reclamation near the Nevada-California state line was used for application of this method. Streamflows at the site were measured for 28 years and return functions and physical data for the dam were available. A time period of one month was chosen. The formulation of the dynamic programming recursive equation was shown. To carry out the calculations, it was necessary to first describe the probabilities of a stream having one flow value in one time period, and another in the next time period. The correlation between monthly stream flows was analyzed by a method in which a linear regression line was established between flows of successive months by a least squares fit to determine a linear relationship between two time periods. With this modified formulation and data for the Watasheamu Dam site, calculations were made by computer. Sample results of the optimum policy determination were given for one of the possible twelve months of the year. (Kriss-Cornell)
W71-06582

HEC-3 RESERVOIR SYSTEM ANALYSIS.
Corps of Engineers, Davis, California. Hydrologic Engineering Center.

Computer Program 723-X6-L2030, Hydrologic Engineering Center, Corps of Engineers, US Army, Davis, California, February 1971. 139 p.

Descriptors: *Computer programs, *Systems analysis, *Reservoirs, *Flow, *Optimization, *Multiple-purpose projects, Input-output analysis, Powerplants, Economics.

The computer program presented was written in Fortran IV and performed a multipurpose routing of a reservoir system by any number of periods of uniform varying length per year based on varying flow requirements at reservoirs, diversion and downstream control points and power peaking and energy requirements at reservoirs. It accepted any configuration of reservoirs, diversions, power plants and control points, and accepted system power demands that override individual power plant requirements, but did not provide for channel routings or percolation losses. It could assign economic values to all outputs and summarize and allocate these in various ways. It could automatically iterate to optimize yield at a specified location. All requirements were supplied from reservoirs so as to maintain a specified balance of storage in all reservoirs and was capable of performing short-interval flood studies. The program was prepared for use in the CDC 6600 computer and all project requirements could be entered in any sequence, but were performed in downstream sequence each period. Input and output data were summarized in the exhibits and operating instructions were given. Proposed future development for the program was discussed. (Kriss-Cornell)
W71-06586

PHREATOPHYTES - A BIBLIOGRAPHY.
Water Resources Scientific Information Center, Washington, D.C.
For primary bibliographic entry see Field 03B.
W71-06596

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 11 - AIRPORT DRAINAGE.
For primary bibliographic entry see Field 08A.
W71-06648

FINANCING CONSTRUCTION OF A MAJOR DRAINAGE IMPROVEMENT,
Peter M. Callihan.
Public Works, Vol 100, No 6, p 105-106, June 1969.

Descriptors: *Storm runoff, *Construction costs, Drainage systems, California.
Identifiers: Drainage improvements.

Rohnert Park, Sonoma County, and the Sonoma County Flood Control District have developed a new method of financing major drainage channels. One channel, which served as a major drainage facility to accommodate storm flows from the anticipated high density development area, could not be improved because of costs. A policy requiring land developers to improve all major drainage ways was adopted and the problem was solved. A large drainage area plan is discussed along with problems of financing its improvements.
W71-06652

REMOTE 'EYES AND EARS' FOR FLOOD WARNINGS,
Corps of Engineers, Boston, Mass. New England Div.
For primary bibliographic entry see Field 07A.
W71-06661

FISHERY MANAGEMENT PROGRAM, EXPANDED PROJECT FOR AQUATIC PLANT CONTROL-FIELD TEST AREAS - FINAL REPORT.
Bureau of Sport Fisheries and Wildlife, Atlanta, Ga. Div. of Fishery Services.
For primary bibliographic entry see Field 05C.
W71-06703

SOIL MOISTURE TYPES OF THE AMUR OBLAST (Russian: Tipy Uvlazhennosti Landshaftov Amurskoy Oblasti),
For primary bibliographic entry see Field 02G.
W71-06710

NORTH RACCOON RIVER FLOOD PLAIN INFORMATION, SAC COUNTY, IOWA.
Corps of Engineers, Rock Island, Ill.

Corps of Engineers Flood Plain Report, June 1970. 51 p, 38 fig, 11 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Iowa, Flood plains, Regional flood, Flood forecasting, Flood control, Historic flood.
Identifiers: Sac County (Iowa), Standard Project Flood, Intermediate Regional Flood.

The flood situation along the North Raccoon River flood plain, in Sac County, Iowa, starting from the county bridge at mile 3.0 upstream to the county bridge at mile 11.97 is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Flood duration on the North Raccoon River is relatively long. During the flood of September 1, 1962, the water rose from an initial stage of 5 feet to peak stage of 18.12 feet in less than 2 days and remained above bankfull stage for 12 days. During the March 1960 flood, the river rose to peak stage of 16.73 feet in about 2 days and remained above bankfull stage for 8 days. (Woodard-USGS)
W71-06721

CEDAR RIVER FLOOD PLAIN INFORMATION, BLACK HAWK COUNTY, IOWA.
Corps of Engineers, Rock Island, Ill.

Corps of Engineers Flood Plain Report, June 1970. 72 p, 44 fig, 27 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Iowa, Flood plains, Regional flood, Flood forecasting, Flood control, Historic flood.
Identifiers: *Black Hawk County (Iowa), Standard Project Flood, Intermediate Regional Flood.

Flooding in Black Hawk County, Iowa, along Cedar River and Elk Run Creek, including the cities of Evansdale, Waterloo, Cedar Falls, and Elk Run Heights is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest known flood occurred in March 1961. Maximum recorded stage at the USGS gaging station was 21.86 feet (elevation 845.95 feet above mean sea level, datum of 1929). The maximum discharge during this flood was 76,700 cfs on March 29, 1961. Standard Project Flood determination indicates that floods could occur on the Cedar River between 6.1 and 12.1 feet higher than the March 1961 flood. (Woodard-USGS)
W71-06722

FLOOD CONTROL PROVISED MAJOR BENEFITS,
Walter J. Wood, and N. Christian Datwyler.
Public Works, Vol 101, No 6, p 67-68, Jun 1970.

Descriptors: *Drainage systems, *Flood control, *Storm drains, Overflow.
Identifiers: *Connecting tunnel.

The Department of Housing and Urban Development recently granted funds to the Los Angeles County Flood Control District for the construction of a storm drainage system. Such a system will eliminate problems caused by accumulated stormwater sumps along the undulating terrain of the area. Such stormwater accumulations have caused drownings and mosquito proliferation, and they sometimes overflow and flood surrounding areas or infiltrate the sewer system creating a health hazard. The project consists of a tunnel connecting storm drains to the Pacific Ocean. The new drainage system will encourage redevelopment in the area by resolving the problems presently making the region an unattractive and often-dangerous place to live.
W71-06758

APPLIED FLOOD HYDROLOGY,
For primary bibliographic entry see Field 05G.
W71-06773

FORT SMITH URBANIZING AREA: WATER, SEWER AND STORM DRAINAGE PLAN, VOLUME I, WATER.

Available from NTIS as PB-195 689, $3.00 in paper copy, $0.95 in microfiche. Report, Arkhoma Regional Planning Commission, Fort Smith, Ark, June 1970. 134 p. HUD Project Ark P-105.

Descriptors: *City planning, *Urbanization, *Water supply, *Land use, Watersheds, Economic feasibility, Arkansas.
Identifiers: Population growth, Economic analysis, *Fort Smith, Arkansas.

The water, sewer and drainage facilities that will be required to meet the needs for a planning period five to ten years are listed and an ultimate areawide system to be provided in the time period of ten to twenty years.
W71-06775

USE OF THE ICE CHANNELING PLOW FOR THE PREVENTION OF ICE BARRAGES,
Defence Scientific Information Service, Ottawa (Ontario).
Ye. N. Tykin.
Available from NTIS as AD-714 413, $3.00 in paper copy, $0.95 in microfiche. Translation of Izvestiya Akademiy: Nauk SSSR, Geographical Series, 1970, 3, p 61-66.

Descriptors: *Ice breakup, *Rivers, *Ice jams, *Navigation.
Identifiers: *Icebreakers, *Sleds, Marine engineering, USSR, Ice barrages, Translations, *Ice channeling plows.

The development of the ice channeling plow promises a considerable simplification of the task of ice barrage prevention at points on a river where ice transit is impeded. There now appears a real possibility of eliminating dangerous ice barrages on our major rivers or in the head regions of nontransfluent forebays or reservoirs.
W71-06783

AREAWIDE WATER AND SEWER PLAN.
Harrison City Planning Commission, Ark.

Available from NTIS as PB-194 162, $3.00 in paper copy, $0.95 in microfiche. Harrison City Planning Commission Comprehensive Study, Harrison, Arkansas, 1970. 20 p. HUD Project ARK P-86.

Descriptors: *City planning, *Sewers, *Water distribution, Water supply, *Water treatment, Water storage, Sewage treatment, Storm drums.
Identifiers: Harrison (Arkansas).

The water and sewer study is based on earlier volumes of the comprehensive plan and projects public utility improvements for the planning area during the planning period.
W71-06788

DRAINAGE STUDY - INVENTORY AND ANALYSIS.
Genesee/Finger Lakes Regional Planning Board, Rochester, N.Y.

Available from NTIS as PB-194 682, $3.00 in paper copy, $0.95 in microfiche. Technical Studies Series No 2, Regional Planning Bd, Rochester, NY, Oct 1969. 130 p, 23 ref.

Descriptors: *Watersheds (Basins), *Drainage, *Drainage programs, Rivers, Lakes, Economic impact, Surface waters, Floods, Population.
Identifiers: *Regional planning, *New York, *Genesse County (New York), *Finger Lakes Region.

The report presents an analysis of the four drainage basins within the Genesee/Finger Lakes Region which provides basic information that will be utilized in future plans and recommendations for the Region. A brief description of the area, topography, climate, population and economy introduces the inventory of the Lake Ontario, Genesee, Oswego and Erie-Niagara Drainage Basins. The heart of this drainage study is devoted to a detailed description of the major lakes, rivers and streams in the four drainage basins.
W71-06790

SELECTION OF MATERIALS FOR SUB-SURFACE DRAINS,
Road Research Lab., Crowthorne (England).
R. Spalding.

Available from NTIS as PB-195 258, $3.00 in paper copy, $0.95 in microfiche. Road Research Laboratory Report LR 346, Crowthorne, 1970. 28 p, 15 fig. (Out of text).

Descriptors: *Sub-surface drains, *Materials, *Roads, Pipes, Drainage systems, Construction materials, Soils, Groundwater, Silts, Permeability, Porosity, Clays, Great Britain.
Identifiers: *Underground drains, Tubes, Fluid filters.

The report discusses the part played by the various components of a sub-surface drain in achieving adequate permeability and in preventing clogging of the drain by silt. Present criteria for the grading limits of the backfill and the porosity of the pipes in a drain are reviewed.
W71-06797

THAI AIR BASE FLOOD CONTROL,
T. L. Adams, and A. C. McNulty.
Military Engr, Vol 61, No 403, p 361-362, Sep-Oct 1969. 1 diag.

Descriptors: *Flood control, *Drainage systems, *Design storm, *Reservoir storage, Runoff.

Expansion of a Royal Thai Air Force Base necessitated development of a flood control system to alleviate drainage problems. An area-wide drainage study considered four possible solutions: (1) a concrete-lined trapezoidal channel to carry runoff around the new runway overrun; (2) a collection basin and pump near the runway; (3) a multicell box culvert under the runway extension; and (4) a flood control storage reservoir with controlled discharge. The economics and feasibility of the four plans were discussed based on a two-year design storm condition, and the storage reservoir method was decided upon. Interior base drainage consisted of a system of ditches, collection channels, and storage basins, plus three pump stations. The new flood control system will also somewhat relieve flooding of the neighboring city by decreasing the runoff rate to it.
W71-06963

MECHANIZATION OF UNDERGROUND DRAINAGE WORK,
For primary bibliographic entry see Field 08H.
W71-06984

RAPID MEASUREMENT OF DRAINAGE DENSITY,
Kentucky Univ., Lexington. Dept. of Geography.
Roger M. McCoy.
Geological Society of America Bulletin, Vol 82, No 3, p 757-762, March 1971. 6 p, 4 fig, 1 tab, 7 ref.

Descriptors: *Terrain analysis, *Drainage patterns (Geologic), *Drainage density, Drainage systems, Channel morphology, Geomorphology, Estimating, Maps, Mapping, Radar, Remote sensing, Analytical techniques, Surveys, Topography, Photogrammetry.
Identifiers: Drainage density measurement.

Investigations were made into three methods for rapid measurement of drainage density using topographic maps and radar imagery. Measurement of blue line stream symbols proves feasible but is weak due to inconsistencies. The number of intersections of streams on a random line pattern overlying a map provides a good estimate of drainage density. Edge-enhancement of radar images produces a measurable line pattern which appears to be strongly-related to total length of streams in a basin. (Knapp-USGS)
W71-07010

A HYDROLOGIC MODEL OF THE BEAR RIVER BASIN,
Utah Water Research Lab., Logan.
Robert W. Hill, Eugene K. Israelsen, A. Leon Huber, and J. Paul Riley.
Available from National Technical Information Service as PB-198 430, $3.00 in paper copy, $0.95 in microfiche. Report PRWG72-1, August, 1970. 85 p, 28 fig, 8 tab, 4 append. OWRR Project B-028-UTAH (2).

Descriptors: *Model studies, *Simulation analysis, Models, Groundwater, *Watersheds, Basins, Snowmelt, Evapotranspiration, Percolation water yield, *Hydrologic cycle, Hydrologic data, Water yield improvement, Soil moisture, *Planning, Watershed management, Hybrid computers.
Identifiers: Hybrid computers.

As demands upon available water supplies increase, there is an accompanying increase in the need to assess the downstream consequences resulting from changes at specific locations within a hydrologic system. The problem is approached in this study by hybrid computer simulation of the hydrologic system. Modeling concepts are based upon the development of basic relationships which describe the various hydrologic processes. Within a system these relationships are linked by the continuity-of-mass principle which requires a hydrologic balance at all points. Spatial resolution is achieved by considering the modeled area as a series of subbasins. The time increment adopted for the model is one month, so that time varying quantities are expressed in terms of mean monthly values. The model is general in nature and is applied to a particular hydrologic system through a programmed verification procedure whereby model coefficients are evaluated for the particular system. In this study the model was synthesized on a hybrid computer and applied to the Bear River basin of western Wyoming, southern Idaho, and northern Utah. Comparisons between observed and computed outflow hydrographs for each subbasin are shown. The utility of the model for predicting the effects of various possible water resource management alternatives is demonstrated for the number 1, or Evanston subbasin. The hybrid computer is very efficient for model development, and the verified model can be readily programmed on the all-digital computer.
W71-07056

4B. Groundwater Management

GROUNDWATER ASPECTS OF THE LOWER HENRYS FORK REGION, EASTERN IDAHO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W71-06490

GEOLOGY AND WATER RESOURCES OF CLAY COUNTY, SOUTH DAKOTA, PART III - BASIC DATA,
South Dakota Geological Survey, Vermillion; and Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W71-06501

POTENTIAL DEVELOPMENT AND RECHARGE OF GROUNDWATER IN MILL CREEK VALLEY, BUTLER AND HAMILTON COUNTIES, OHIO, BASED ON ANALOG MODEL ANALYSIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W71-06509

THE DETECTION OF MAGNETIC FIELDS CAUSED BY GROUNDWATER AND THE CORRELATION OF SUCH FIELDS WITH WATER DOWSING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 07B.
W71-06655

RECHARGE OF AQUIFERS IN ARID ZONES AND EFFECTIVE POROSITY COEFFICIENT,
M. Boreli.
Transactions Institute for Development of Water Resources, 'Jaroslav Cerni,' Vol 14, No 45, p 13-19, 1969. 7 p, 6 fig, 5 ref.

Descriptors: *Recharge, *Pit recharge, *Surface-groundwater relationships, *Conjunctive use, *Water storage, Analog models, Hydraulic models, Model studies, Artificial recharge, Arid lands, Water management (Applied), Reservoir leakage, Seepage, Groundwater movement, Unsteady flow.
Identifiers: Yugoslavia.

The combination of surface and underground reservoirs is an attractive solution for the problems of arid zones using the surface reservoir as a storage basin for the recharge of the aquifer. The duration of surface storage ought to be as short as possible, and recharge ought to take place in the cold season when the loss of water due to evaporation is considerably smaller. Occasional drying out of the reservoir is indispensable to keep recharge rates high, especially because in warm regions biological clogging of the bottom of the reservoir is considerable and inhibits recharge. The study of intermittent recharge of aquifers is therefore of great practical importance. Several types of intermittent recharge used in the Mediterranean littoral include some cases of lateral recharge in reservoirs with impermeable bottoms, with recharge only through the sides. Intermittent recharge of aquifers, lateral recharge and in particular intermittent lateral recharge cause a very complicated unsteady flow. Because of its simplicity the viscous fluid analog seems to be the most suitable method of study of the recharge zone. (See also W71-06704) (Knapp-USGS)
W71-06705

GEOHYDROLOGIC INVESTIGATIONS IN THE MESILLA VALLEY, NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-06729

GROUNDWATER AND WELLS.
University Oil Products, St. Paul, Minn. Johnson Div.

St Paul, Edward E Johnson, 1966. 440 p.

Descriptors: *Water wells, *Drilling, Drilling equipment, Rotary drilling, Drawdown, Specific yield, Well hydraulics, Well screens, Corrosion, Water quality, Hydrology.
Identifiers: Groundwater regions, Well hydraulics, Groundwater exploration, Analyzing sand samples, Water well design, Well screen installation, Developing and completing wells, Disinfection, Maintaining well yield, Elements of water treatment, Well specifications, Pumps, Sanitary protection of a water supply, Groundwater conservation and utility.

The purpose of this book is to present the technical aspects of groundwater occurrence, groundwater movement, well hydraulics, well design and groundwater geology together with the practical aspects of well drilling, well screen selection, well maintenance and well operation. It describes and explains in some detail the operations that depend upon the skill of the well contractor and his drilling crews and endeavors to present practical, proven ideas. Well construction, by its very nature, is not a routine process. The variability of geologic conditions - and that of groundwater occurrence within the geologic framework - are so extensive as to make each drilling operation an exploratory undertaking, even a few tens of feet distant. The skill of the well driller that enables him to handle unforeseen situations successfully is basic to proper groundwater development. This book is an excellent source of information for the driller. (Campbell-NWWA)
W71-06920

GROUNDWATER PRODUCTION FROM THE BEDROCK OF SWEDEN,
Craelius Terratest AB, Stockholm (Sweden). Geological Dept.
For primary bibliographic entry see Field 08A.
W71-06923

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Center, Philadelphia, Pennsylvania.
For primary bibliographic entry see Field 03B.
W71-06933

THE EFFECT OF HEAT ON SOME MECHANICAL PROPERTIES OF IGNEOUS ROCKS,
Gulf Research and Development Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 08E.
W71-06942

DON'T POLLUTE A CLEAN RESERVOIR.
Oil and Gas Journal, Tulsa, Okla.
For primary bibliographic entry see Field 05B.
W71-06943

PRINCIPLES AND PRACTICAL METHODS OF DEVELOPING WATER WELLS.
U.O.P., St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08B.
W71-06944

GEOPHYSICS AS AN AID TO THE SMALL WATER WELL CONTRACTOR,
Lansing Board of Water and Light, Mich.
C. J. Linck.
Groundwater, Vol 1, No 1, p 33-37, January 1963. 6 fig, 5 ref.

Descriptors: *Borehole geophysics, *Water wells, Resistivity, Radioactivity, Seismic studies, Logging (Recording), Electric logging, Aquifer characteristics, Geophysics, Groundwater, Exploration.
Identifiers: Seismic refraction exploration.

Geophysical techniques, as used in groundwater exploration are subdivided into 'bore-hole' and 'surface' methods. The former include the commonly used electrical and gamma-ray logging and the less commonly used hole calipering and current meter logging. Included with this classification, but important enough to be considered separately, is the field of water-level measurements. The surface techniques discussed include electrical resistivity and refraction seismograph exploration. Because of the type of data which they yield the surface methods are most economical where much area is to be explored and large quantities of water are needed. These factors limit the use of the techniques by small water well contractors in domestic water well work. These same contractors, on the other hand, can gain real economic advantages, in many cases, by use of one or more of the bore-hole methods. Geophysical methods properly used can do much to guide the water well contractor. It is extremely important, however, that their use be carefully directed because in the past, where geophysical methods have failed, it has often been due to the incorrect application of the technique, rather than a failure of the technique. (Campbell-NWWA)
W71-06946

INTERPRETATION OF ELECTRIC LOGS IN FRESH WATER WELLS IN UNCONSOLIDATED FORMATIONS,
Schlumberger Well Surveying Corp., Houston, Tex.
For primary bibliographic entry see Field 03B.
W71-06947

HYDRAULIC FRACTURING,
For primary bibliographic entry see Field 08B.
W71-06950

STATUTES AND REGULATIONS GOVERNING PRIVATE WATER WELL CONSTRUCTION AND PUMP INSTALLATIONS,
Wisconsin State Board of Health, Madison. Well Drilling and Sanitation Services.
For primary bibliographic entry see Field 06E.
W71-06953

LOGGING DRILL CUTTINGS,
Geological Survey, Norman, Okla.
J. C. Maher.
Oklahoma Geol Surv Guide Book 14, 1964, (2nd Edition). 48 p, 60 ref.

Descriptors: Sampling, *Drilling, *Oil industry, *Water wells, Cores, On-site data collections, Logging (Recording).
Identifiers: *Drillers' logs, Drilling time logs, Electric logs, Radioactivity logs, Sample logs, Cable-tool cuttings, Rotary-tool cuttings, Air-drill cuttings.

This report has been prepared primarily to provide a reference, a manual, and a set of descriptive standards for subsurface investigations in the Midcontinent region. As a reference, it provides details of commonly used procedures which cannot be fully described in every subsurface report. As a manual, it should aid in orienting or training geologists in subsurface methods. As a set of descriptive standards, it is hoped that it will encourage greater care and standardization in all phases of preparation of sample logs because these logs form the foundation upon which the geologic history of sedimentary basins may be reconstructed. Specifically this report describes the preparation of composite interpretive logs and presents a system of description including terminology and definitions, abbrevations, and symbols. General discussions of drillers logs, drilling-time logs, electric logs, radioactivity logs, and sample logs are included to explain their supporting role in preparing composite interpretive logs. It is intended to show the advantages and limitations of this method, and to define somewhat more specifically the terms that have become firmly established in subsurface work during the past 40 years and are now recorded on hundreds of thousands of well logs in oil-company and government-agency files. It is also of use to drillers to help them appreciate the primary problems of the geologist and to offer guidance in the preparation of a better driller's log. (Campbell-NWWA)
W71-06955

WELL DRILLING MANUAL.
Koehring Co., Enid, Okla. Speedstar Div.
For primary bibliographic entry see Field 08A.
W71-06956

ON THE MANAGEMENT OF GROUNDWATER IN COASTAL AQUIFERS,
North Carolina State Univ., Raleigh. Dept. of Civil Engineering.
Abdel-Aziz I. Kashef.
Groundwater, Vol 9, No 2, p 12-20, March-April 1971. 9 p, 56 ref.

Descriptors: *Reviews, *Water management (Applied), *Groundwater, *Water resources development, *Saline water intrusion, Withdrawal, Drawdown, Sea water, Coasts, Aquifers.
Identifiers: Coastal aquifers.

Groundwater management in coastal aquifers is an important phase in water resources especially in the operation of existing coastal wells or in planning new coastal well fields. Basic research to evaluate properly the various elements of sound management should not be overlooked. Basic research is still needed to study the roots of the problem. Aquifers should be studied as hydrogeologic units for the benefit of all interested parties. Economic and legal decisions have to be made to establish priorities and allotments. Extensive basic research is needed in salt-water encroachment. Extensive research is needed to solve many of the water recharge and leakage problems. (Knapp-USGS)
W71-07005

A SHORTCUT FOR COMPUTING STREAM DEPLETION BY WELLS USING ANALOG OR DIGITAL MODELS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W71-07006

GROUNDWATER FLUCTUATIONS IN RESPONSE TO ARBITRARY PUMPAGE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02F.
W71-07007

WELLS AND SPRINGS IN CALIFORNIA AND NEVADA WITHIN 100 MILES OF THE POINT 37 DEGREE 15' N., 116 DEGREE 25'W., ON NEVADA TEST SITE,
Geological Survey, Denver, Colo.
William Thordarson, and B. P. Robinson.
Available from the National Technical Information Service as USGS-474-85, $3.00 in paper copy, $0.95 in microfiche. Geological Survey Report USGS - 474-85, 1971. 178 p, 4 fig, 8 tab, 77 ref. USAEC Agreement No AT (29-2)-474.

Descriptors: *Data collections, *Hydrologic data, *Nevada, *Wells, *Springs, Reviews, Nuclear explosions, Water yield, Damages, Legal aspects, Groundwater, Aquifers, Hydrogeology, Alluvium.
Identifiers: *Nevada Test Site.

Studies of published and unpublished geologic and groundwater data were reviewed for an inventory of 6,032 wells and 754 springs in parts of Inyo and Mono Counties, California, and Clark, Esmeralda, Lincoln, and Nye Counties, Nevada. A complex sequence of granitic, metamorphic, volcanic, and sedimentary rocks of Precambrian to Holocene age are present in the study area. The valley fill alluvium is the best aquifer. The carbonate and the volcanic rocks produce small to large amounts of water from fractures or solution cavities. The clastic rocks and the metamorphic and granitic rocks produce very little groundwater. The greatest concentration of wells in the study area is in the Las Vegas area, which has 79% of the total wells inventoried. The Las Vegas area has less than 1% of the springs inventoried. The major uses of groundwater listed in order of abundance, for the area exclusive of Las Vegas, are irrigation, domestic, public supply, and industrial. The major uses of groundwater listed in order of abundance in the Las Vegas area are domestic, irrigation, public supply, and commercial. (Knapp-USGS)
W71-07029

PUMPAGE AND GROUNDWATER STORAGE DEPLETION IN CUYAMA VALLEY, CALIFORNIA, 1947-66,
Geological Survey, Menlo Park, Calif.
John A. Singer, and W. V. Swarzenski.
Geological Survey Open-file Report, August 3, 1970. 22 p, 7 fig, 3 tab, 9 ref.

Descriptors: *Groundwater, *Overdraft, *Recharge, *California, *Water resources development, Aquifers, Hydrogeology, Pumping, Withdrawal, Drawdown, Water levels, Water level fluctuations, Water quality, Water table, Water utilization, Irrigation.
Identifiers: *Cuyama Valley (Calif).

Water-level declines of as much as 160 feet have occurred in the Cuyama Valley since 1947. The 1947-66 overdraft is estimated at 21,000 acre-feet annually and is causing a water-level decline from 2 to 8 feet per year over an area of about 35,000

acres. Most of the groundwater body is unconfined, but groundwater movement is restricted by faulting. About half of the current natural groundwater recharge is used in the valley, and the other half is lost by evapotranspiration. Groundwater quality is only fair and is gradually becoming worse as water from irrigated land returns to the water table. In many areas of the valley imported water could be successfully recharged to the groundwater basin by spreading in surface-recharge basins. Recharging might be most beneficial where permeable deposits have a large unsaturated storage capacity. (Woodard-USGS)
W71-07039

WATER WELL EXPLOSIONS: AN ENVIRONMENTAL HAZARD,
Pennsylvania State Univ., University Park. Coll. of Earth and Mineral Sciences.
D. P. Gold, R. R. Parizek, and T. Giddings.
Earth and Mineral Sciences, Vol 40, No 3, p 17-19, December 1970. 3 p, 5 fig, 12 ref.

Descriptors: *Water wells, *Domestic water, *Explosions, *Pennsylvania, Thunderstorms, Lightning, Electric motors, Gases, Evaluation.
Identifiers: *Water-well explosion.

During a thunderstorm on June 12, 1970, an explosion in a water well in the yard of a private dwelling (14 miles east of State College, Pennsylvania) demolished a concrete pump house and excavated a crater 25 feet across. The explosion threw debris hundreds of feet into the air, and the pump itself (200 lb) cleared the adjacent trees and a 38-foot high power line and landed in the field across the highway, 179 feet away. From the geologic setting and landuse, the type of explosive can be narrowed down to a gas accumulation from either (1) a flammable pollutant, (2) decomposed organic material, or (3) fossil gas or petroleum. The cause of this explosion may never be determined, but the presence of a flame reported by an eyewitness and the lack of burn marks in the crater suggest an explosion deep within the well shaft. (Woodard-USGS)
W71-07040

4C. Effects on Water of Man's Non-Water Activities

SUBURB MEETS URBANIZATION HEAD-ON.
For primary bibliographic entry see Field 05D.
W71-06551

URBAN PLANNING ASPECTS OF WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W71-06567

ASSESSING THE QUALITY OF URBAN DRAINAGE,
For primary bibliographic entry see Field 05B.
W71-06575

HYDROLOGICAL AND ENVIRONMENTAL CONTROLS ON WATER MANAGEMENT IN AN ARID URBAN AREA,
Arizona Water Resources Research Center, Tucson.
Sol D. Resnick, and Kenneth J. DeCook.
Paper, American Association for the Advancement of Science, Annual Meeting, Chicago, Illinois, December 1970. 16 p, 1 fig, 1 tab, 10 ref. OWRR Project B-012-ARIZ (2).

Descriptors: *Recreation facilities, *Urbanization, *Flood protection, *Watershed management, *Environmental effects, Water conservation, Dry seasons, Coliforms, Decision making, Planning, Control, Chemical oxygen demand, Economic feasibility, Recharge, Domestic water, Activated carbon, Irrigation water, Water requirements, Chlorination, Turbidity, Runoff, Rainfall, Data collections, Simulation analysis, Mathematical models, Water management (Applied), Water quality, Water reuse, Treatment, Storm runoff, Flood damage, Flood control, Flood plains, Convection, Water levels, Arizona, Water wells, Arid lands.
Identifiers: *Greenbelts, *Rainfall-runoff-water quality process, *Urban watershed, *Rural watershed, Alum, Tucson.

Southwestern arid cities are rapidly growing. Additional wells, which support subdivisions, grassed medians, parks and water-based recreation, contribute to perennial water-level declines. Storm sewers are usually nonexistent. Vehicles may be washed away, and urbanites may drown during summer convective storms. A more reasonable urban plan includes: (1) allow homes only outside flood plains; (2) create greenbelts along channels; (3) manage storm runoff to reduce peaks, provide storage, treatment and reuse; and (4) depress medians. Field data from urban areas, regarding storm volumes and intensities, and runoff quality and quantity, are urgently needed to manage storm water. Mathematical models and simulations for analyzing rainfall-runoff-water quality processes need to be developed, refined and applied. Data is being collected on 3 urban and 2 rural watersheds in Tucson by the University of Arizona as a data base. About 2 1/2% of the rainfall becomes runoff in the rural watersheds. Urban runoff is low in turbidity, which may be reduced by alum, and high in COD and fecal coliforms, particularly after sustained dry periods. Chlorination would allow irrigation or water-contact recreation. Activated carbon process, before chlorination, would allow domestic use. Future work includes detailed rainfall and runoff water-quality analysis, treatment, storage and recharge studies, economic analysis and pilot studies. (Popkin-Arizona)
W71-06597

DRAINAGE OF ROADS AND PAVED SURFACES,
M. J. Hamlin, and F. D. Hobbs.
Inst. of Public Health Engrs, Vol 69, Part 2, p 122-141, Apr 1970.

Descriptors: *Rainfall intensity, *Storm drains, Hydraulic design, Roads.
Identifiers: *Stormwater inlets.

Factors to be considered in designing stormwater inlets for roads are discussed utilizing hydraulic requirements rather than a purely empirical viewpoint. Rainfall intensity is one determining factor since, theoretically, rainfall intensity is a function of the area to be drained. The intensity of rainfall and the period for which it lasts varies across the country, and therefore, this factor must be carefully evaluated before designing stormwater inlets.
W71-06626

EFFECTS OF URBAN DEVELOPMENT ON FLOODS IN NORTHERN VIRGINIA,
Geological Survey, Washington, D.C.
Daniel G. Anderson.
For sale by Superintendent of Documents, US Government Printing Office, Washington, D.C. 20402, 25 cents. Geological Survey Water-Supply 2001-C, 1970. 22 p, 5 fig, 5 tab, 10 ref.

Descriptors: *Rainfall-runoff relationships, *Urbanization, *Flood damage, *Virginia, *District of Columbia, Erosion, Watersheds (Basins), Hydrologic data, Floods, Mathematical studies, Geomorphology, Streamflow, Precipitation (Atmospheric), Land use, Effects, Peak discharge, Drainage, Runoff, Drainage systems, Planning, Sediment transport, Flood forecasting, Hydrograph analysis.
Identifiers: *Urban Hydrology, Northern Virginia.

Graphical and mathematical relations are presented to estimate the flood-peak magnitudes having recurrence intervals ranging up to 100 years for drainage basins with various degrees of urban or suburban development. Five independent variables are required for use of the relations. They are the size, length, and slope of the basin, which may be measured from maps, and the percentage of impervious surface and type of drainage system, which may be evaluated by a basin inspection but in actual practice will usually be estimated for future developed conditions. Based upon analysis of flood information for 81 sites, 59 of which are in the Washington, D.C., metropolitan area, the relations should be useful for design of drainage systems and for definition of flood limits. The relations presented are applicable only to the Washington, D.C., area, but the method of analysis is general and may be used for any area where the major floods result from rainfall. Urban and suburban development affect floodflows significantly. Improvements of the drainage system may reduce the lag time to one-eighth that of the natural channels. This lag-time reduction, combined with an increased storm runoff resulting from impervious surfaces, increases the flood peaks by a factor that ranges from two to nearly eight. The flood-peak increase depends upon the drainage-basin characteristics and the flood recurrence interval. (Woodard-USGS)
W71-06690

ANNOTATED BIBLIOGRAPHY ON SNOW AND ICE PROBLEMS,
Toronto Univ., Ontario, Canada. Dept. of Geography.
For primary bibliographic entry see Field 02C.
W71-06719

CONSERVATION PROGRAMS IN THE URBAN FRINGE,
John W. Neuberger.
J Soil Water Conserv, Vol 24, No 6, p 216-618, Nov/Dec 1969. 6 ref.

Descriptors: *Conservation, *Storm drains, *Drainage, Erosion control, Runoff, Sediment control, Nebraska, Urbanization, Water pollution control.

Solutions to land erosion and drainage problems caused by suburban sprawl in a Nebraska conservation district are outlined. Increased paving, roofing, and compacted soils result in erosion and flooding; therefore, the construction of major and minor storm drainage and water runoff systems is recommended. An Omaha program to reduce sedimentation from developing areas is detailed in addition to guidelines for good land resource conservation. Examples of developers' initiatives towards furthering the urban conservation program are cited.
W71-06751

RIVER ENGINEERING AND WATER CONSERVATION WORKS,
For primary bibliographic entry see Field 05G.
W71-06771

THE USE OF BALANCING RESERVOIRS AND FLOW REGULATING RESERVOIRS IN DEALING WITH RUN-OFFS FROM URBAN AREAS,
For primary bibliographic entry see Field 05G.
W71-06772

URBAN ECONOMICS AND PLANNING, VOLUME I, A DDC BIBLIOGRAPHY.
Defense Documentation Center, Alexandria, Va.

Available from NTIS as AD-714 500, $3.00 in paper copy, $0.95 in microfiche. DDC-TAS-70-73-1, Cameron Station, Alexandria, Va, Oct 1970. 235 p with index.

Descriptors: *City planning, *Urbanization, *Social aspects, Bibliographies, *Economics, Cost allocation, Urban renewal, Transportation.
Identifiers: *Urban planning, Sociometrics, Water pollution.

The bibliography includes annotated references to reports on urban area problems, regional planning and development, sociometrics, urban renewal, transportation, traffic, noise and communications. Corporate author-monitoring agency, and subject, indexes are included.
W71-06777

EFFECT OF A COMMERCIAL CLEARCUTTING IN WEST VIRGINIA ON OVERLAND FLOW AND STORM RUNOFF,
Kenneth G. Reinhardt.
Forest, Vol 62, No 3, p 167-171, 1964.

Descriptors: *Rainfall-runoff relationships, Watershed management, Watersheds (Basins), Overland flow, Storm runoff, West Virginia, Infiltration, Hydrologic aspects.
Identifiers: Experimental watersheds.

A commercial clearcutting was made on a 74-acre gaged watershed on the Fernow Experimental Forest; skidroads were loggers' choice--without limitations as to grade or provisions for drainage. After-logging infiltration rates in the watershed remained well maximum rainfall intensities except on portions of the skidroads. Overland flow occurred only from the skidroads; it resulted from the combination of rain directly on the skidroads and interception of subsurface flow by the road cuts. Increased storm runoff in the growing seasons--up to a maximum of about 1/2 area-inch in any one storm--was largely the result of decreases in field-moisture deficiency rather than changes in the proportions of surface and subsurface flow. This study indicates that, in judging hydrologic condition of logged areas, perhaps as much emphasis should be placed upon road conditions and forest-floor disturbance as upon the amount of timber cut and condition of the stand.
W71-06970

4D. Watershed Protection

CONTROL OF SEDIMENT FLOW INTO SUBSURFACE DRAINS,
Ohio Agricultural Research and Development Center, Columbus; and Agricultural Research Service, Columbus, Ohio. Soil and Water Conservation Research Div.
Om P. Gulati, Glenn O. Schwab, and Ronald C. Reeve.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 96, No IR 4, p 437-449, December 1970. 13 p, 10 fig, 1 tab, 8 ref, append.

Descriptors: *Subsurface drains, *Tile drains, *Sediment control, Velocity, Sediment transport, Sedimentation, Silting, Filters, Sands, Analog models, Hydraulic models.
Identifiers: Drain sedimentation.

Sediment inflow into subsurface drains in noncohesive soils may be alleviated by using an impervious cover over a drain having inflow openings only at the top. Water flows between the cover and the outer drain surface in an upward direction before entering the openings at the top of the drain. Sediment inflow is prevented if the flow velocity is less than the critical boiling velocity. In this paper the shape of the upflow channel openings and the velocity distribution across the openings are evaluated. Terzaghi's concept of effective stress is the basis for the theoretical velocity distribution. An electric analog model was employed to verify this theory. A laboratory model was used to determine critical velocities. Critical boiling velocities for fine sand and glass beads are about 1% of Stoke's settling velocity. Within reasonable limits the upflow channel width and shape can be designed to prevent movement of sediment. High water tables have the greatest influence on velocity. (Knapp-USGS)
W71-06500

ERROR ANALYSIS AND SYSTEM IDENTIFICATION OF WATER BALANCE AND THE RAINFALL EXCESS COMPONENT IN REAL AND MODEL WATERSHEDS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W71-06578

SYSTEMS THEORY: A NEW APPROACH FOR MODELLING WATERSHEDS REALISTICALLY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W71-06579

EXPERIMENTAL PROGRAM FOR ANALYSIS AND VALIDATION OF WATERSHED MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W71-06580

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

ATMOSPHERIC TECHNETIUM-99,
East Texas State Univ., Commerce. Dept. of Chemistry.
Moses Attrep, John A. Enochs, and Larry D. Broz.
Environmental Science and Technology, Vol 5, No 4, p 344-345, April 1971. 2 p, 1 tab, 4 ref.

Descriptors: *Trace elements, *Rain water, *Radioisotopes, *Radiochemical analysis, Test procedures, Atmosphere, Water chemistry.
Identifiers: *Technetium-99.

Technetium-99 was isolated from 13 rain samples collected in 1967. The sizes of these samples were 53.5 to 233 liters. The concentrations of Tc-99 varied from 0.14 X 10 to the minus 2 to 1.7 X 10 to the minus 2 pCi/liter. Radioactive measurements were conducted on a Tracerlab Omniguard Low Level Beta Counter. The background of the counting system was about 0.3 cpm. Identification of the Tc-99 activity is based on indirect evidence. The observed activity in the rain samples followed the chemistry of technetium. Because the activities of these samples were low, and the half-life is so long, customary identification is impossible. Samples were counted for over two years with no decrease in activity. Since the availability and use of this fission produced nuclide have increased in recent years, Tc-99/is becomming widespread both in the atmosphere and in the natural water system. (Woodard-USGS)
W71-06457

CONTINUOUS MONITORING OF WATER SURFACES FOR OIL FILMS BY REFLECTANCE MEASUREMENTS,
Shell Development Co., Emeryville, Calif.
Alvin D. Goolsby.
Environmental Science and Technology, Vol 5, No 4, p 356-357, April 1971. 2 p, 3 fig, 1 ref.

Descriptors: *Oil, *Oil-water interfaces, *Monitoring, *Oil wastes, *Water pollution sources, Laboratory tests, Test procedures, Light, Refractivity, Prototype tests, Effluent streams, Industrial wastes.
Identifiers: *Oil film monitoring.

Laboratory experimentation and plant tests show that the use of reflectance measurement is a promising means of continuously monitoring water surfaces for oil contamination. The instrument resulting from these experiments in both simple and sensitive and can be used as a qualitative analyzer which would sound an alarm if oil slicks of significant size are detected. A laboratory arrangement consisting of an incandescent lamp, collimating lens, and photodetector was used to generate a light beam incident on a water surface and to measure the intensity of the reflected beam. The measured average intensity, using an angle of incidence of 30 deg increased 100% when a drop of 'waste oil' was introduced on the water. The actual intensity increase is significantly greater than the calculated value. This is possibly due to multiple internal reflections and light absorption in the oil film because thin films of oil on water give rise to more reflected light than very thick films. A prototype oil film monitor was constructed for tests of the reflectance principal in a refinery effluent stream. (Woodard-USGS)
W71-06459

DIELDRIN AND ENDRIN CONCENTRATIONS IN A LOUISIANA ESTUARY,
Ogden Coll. of Science and Technology, Bowling Green, Ky, and Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science; and Franklin Inst., Boston, Mass; and Riverside Research Labs., La Chasse, La.
For primary bibliographic entry see Field 05B.
W71-06460

CHLORINATED HYDROCARBON PESTICIDES IN IOWA RIVERS,
Iowa Univ., Iowa City. State Hygienic Lab.
For primary bibliographic entry see Field 05B.
W71-06461

THE QUANTITY, COMPOSITION AND DISTRIBUTION OF SUSPENDED PARTICULATE MATTER IN THE GULF OF CALIFORNIA,
Scripps Institution of Oceanography, La Jolla, Calif.
B. Zeitzschel.
Marine Biology, Vol 7, No 4, p 305-318, December 1970. 14 p, 15 fig, 6 tab, 48 ref. Bur Commercial Fisheries Contract 14-17-0007-963.

Descriptors: *Suspended load, *Seston, *Sea water, Organic matter, Silts, Sediment load, Suspension, Primary productivity, Nutrients, Instrumentation, Mineralogy, Plankton, Analytical techniques, Sampling.
Identifiers: *Gulf of California.

The quantity and quality of suspended particulate matter were estimated in 34 samples from the euphotic zone of 9 stations in the Gulf of California. The results from electronic, microscopic and chemical analyses showed that most parameters measured were significantly correlated. The total particulate volume from particles of 2 to 150 microns diameter, as obtained from the Coulter Counter, were significantly related to such parameters as seston, particulate nitrogen, particulate carbon, phytoplankton carbon and chlorophyll a. The Coulter Counter can be a very useful instrument to determine, with little effort, the size, distribution, and volume of particulate suspended matter in the sea. These data can then be used to calculate some important biological parameters which are necessary to establish meaningful models of phytoplankton production. (Knapp-USGS)
W71-06494

STABLE CARBON ISOTOPE RATIOS AS INDICES OF PETROCHEMICAL POLLUTION OF AQUATIC SYSTEMS,
Texas Univ., Port Aransas. Inst. of Marine Science.
John A. Calder, and Patrick L. Parker.
Environmental Science and Technology, Vol 2, No 7, p 535-539, July 1968. 5 p, 2 fig, 4 tab, 10 ref.
NSF Grants GA-299 and GA-911.

Descriptors: *Pollutant identification, *Water pollution sources, *Stable isotopes, *Oil wastes, *Surface waters, Carbon, Organic matter, Oil industry, Oily water, Streams, Texas, Analytical techniques, Methodology, Spectrophotometry, Water quality.
Identifiers: *Carbon isotope ratios.

Variations in the C-13/C-12 ratio of dissolved and particulate organic matter from several aquatic systems were investigated. These measurements were made for natural and organic chemically polluted systems. Delta C-13 natural systems ranges between -14 and -23 relative to the National Bureau of Standards isotope reference material No. 20. Petrochemical products and petrochemical effluents are much more depleted in C-13 with a range from -25 to -49. Delta C-13 of the dissolved organic matter was measured for 15 samples from the Houston, Tex., Ship Channel. Model calculations based on these data suggest that the C-13/C-12 ratio of dissolved organic matter may serve as a quantitative index of petrochemical pollution. The studies described are the test of the idea that stable isotope ratios may serve as a useful index of organic pollution of aquatic systems. The data suggest that this is the case. (Woodard-USGS)
W71-06515

THE PATUXENT RIVER, REPORT NO 4, PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY - SUMMER SURVEYS, 1964-1966,
Maryland Dept. of Water Resources, Baltimore. Div. of Water Quality Investigations.
For primary bibliographic entry see Field 05B.
W71-06516

OHIO RIVER VALLEY WATER SANITATION COMMISSION: SEVENTEENTH, EIGHTEENTH, NINETEENTH, AND TWENTIETH YEARBOOKS.
For primary bibliographic entry see Field 05G.
W71-06564

PROPOSED PROCEDURE FOR DETERMINING QUANTITY AND QUALITY OF STORM FLOW,
M. B. Fielding.
Water Resources Comm, Div Res Pap No 2002, 1966.

Descriptors: Measurement, Flow, Planning.
Identifiers: *Storm sewage, Suspended solids.

The author outlines a suitable procedure for measuring the flow of storm sewage and for collecting samples for the determination of BOD and suspended solids. A graphical form is proposed for reporting the results.
W71-06566

WATER QUALITY MONITORING FIELD STUDIES,
Bruce R. Barrett.
Paper presented at the Calif Water Pollution Control Assoc 42nd Annual Conference, Sacramento, Calif, April 29 to May 1, 1970.

Descriptors: *Monitoring, *On-site investigations, *Instrumentation, Water pollution, Sources, Water quality.

Continuous water quality monitors have been used by the Technical Services Program of the Robert S. Kerr Water Research Center, Ada, Oklahoma, in a variety of field water pollution studies and for various purposes. Two commercially available types of monitors have been used. Monitors were used in the James River Project along with recording flow gages to determine the relationship between stream quality and storm runoff. In a before-and-after type study to determine differences in quality due to navigation impoundments, monitors were used to establish the existing quality of the waterway. In a research study of a refinery waste treatment plant, a monitor was used to study the various unit processes for purposes of treatment control and overall refinery waste monitoring. The sample taking capability of the monitors was indispensable in an enforcement case involving a mine waste.
W71-06569

FECAL COLIFORM CONCENTRATIONS IN STORMWATERS,
For primary bibliographic entry see Field 05B.
W71-06570

SEASONAL VARIATIONS IN SURVIVAL OF INDICATOR BACTERIA IN SOIL AND THEIR CONTRIBUTION TO STORMWATER POLLUTION,
For primary bibliographic entry see Field 05B.
W71-06571

THE BACTERIOLOGICAL ASPECTS OF STORM-WATER POLLUTION,
For primary bibliographic entry see Field 05B.
W71-06572

WATER QUALITY AT PATUXENT RIVER BRIDGE, MARYLAND - JANUARY 1968 THROUGH NOVEMBER 1969,
Geological Survey, Arlington, Va.
Robert L. Cory, and Jon W. Nauman.
Geological Survey Open-file Report, 1971. 51 p, 8 fig, 1 tab, 16 ref.

Descriptors: *Water quality, *Estuaries, *Maryland, *Monitoring, Hydrological data, Data collections, Sampling, Stream gages, Water level fluctuations, Primary productivity, Water pollution effects, Nutrients, Sewage, Water pollution sources, Thermal pollution, Tides, Dissolved oxygen, Turbidity.
Identifiers: *Patuxent Estuary (Md).

An 8-parameter water quality monitor was operated on the Patuxent estuary, Maryland, from October 1963 to December 1969. Surface temperatures over the entire period ranged from -1.1 deg to 32.0 deg C. The effects of thermal discharges from a steam electric station located 6.5 KM upstream were slight and detectable only during the late phase of the ebb tide. The lowest annual average salinity was recorded during 1968. The 1969 salinity record was unusual in that no springtime low in salinity occurred because of an early spring rainfall deficiency. Turbidity ranged from about 7 to 170 JCU. Diurnal records of dissolved oxygen in the summer of 1968 and 1969 reflected the oxygen produced by phytoplankton stimulated from upstream domestic waste discharges. Average daily gross primary plant production increased 20%. The mean range of tide was 1.9 feet with an extreme range of 6.1 feet during 1968 and 1969 as compared to 6.7 for the 4 previous years. (Knapp-USGS)
W71-06664

MERCURY CONTENT OF ILLINOIS COALS,
Illinois State Geological Survey, Urbana.
R. R. Ruch, Harold J. Gluskoter, and E. Joyce Kennedy.
Illinois Geological Survey Environmental Geology Notes, No 43, February 1971. 15 p, 6 fig, 4 tab, 7 ref.

Descriptors: *Pollutant identification, *Heavy metals, *Trace elements, *Coals, Coal mines, Pyrite, Methodology, Analytical techniques, Chemical analysis, Laboratory tests, Mineralogy, Neutron activation analysis.
Identifiers: *Mercury.

Fifty-five raw coal samples from 10 coal seams in Illinois have a mean mercury concentration of 0.18 part per million and a mode that lies between 0.10 ppm and 0.12 ppm. Eleven coal samples from states other than Illinois have mercury concentrations within the same range as Illinois coals, or slightly lower. The neutron activation method used for the determination of mercury in coal, developed at the Illinois State Geological Survey, has a sensitivity of approximately 0.01 ppm and a precision of about 20 percent. Three coal samples were individually separated into specific gravity fractions in the laboratory, and all exhibited a mercury reduction of at least 50 percent in the lightest coal fraction and a concentration of mercury in the heaviest fraction. A more detailed study of a single coal sample suggests that a significant part of the mercury is associated with the pyrite in the coal, and the remainder (perhaps up to 50 percent) is in organic association. (Woodard-USGS)
W71-06666

RECONNAISSANCE OF SELECTED MINOR ELEMENTS IN SURFACE WATERS OF THE UNITED STATES, OCTOBER 1970,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-06670

ANALYTICAL PROCEDURES FOR MEASURING CHEMICALS IN THE PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS, 1962,
For primary bibliographic entry see Field 05F.
W71-06765

QUANTITIES AND CHARACTERISTICS OF FARM-ANIMAL WASTES,
Public Health Service, Chicago, Ill. Bureau of Solid Waste Management.
For primary bibliographic entry see Field 05G.
W71-06812

AESTHETICS AND ODORS,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05G.
W71-06814

DETERMINATION OF SOME CHEMICAL AND PHYSICAL RELATIONSHIPS FROM RECORDING METERS IN LAKES,
Ontario Water Resources Commission, Toronto.
Merv D. Palmer, and J. Bryan Izatt.
Water Research, Vol 4, No 12, p 773-786, December 1970. 14 p, 6 fig, 9 tab, 9 ref.

Descriptors: *Path of pollutants, *Monitoring, *Water quality, *Lakes, *Lake Erie, Water pollution sources, Water pollution effects, Pollutant identification, Instrumentation, Statistical methods, Current meters, Dissolved oxygen, Hydrogen-ion concentration.
Identifiers: *Water quality monitoring.

Hourly readings of current, conductivity, pH and dissolved oxygen were collected during May and June, 1969, 1.6 km offshore at the mid-depth of a total depth of 6 m on Lake Erie. The nearest major sewage outfall is 6 km to the west of the measuring location. Data collected in this manner requires extensive conditioning before meaningful time series analytical techniques are applied. Conductivity was found to correlate directly with water movement in the nearshore areas of lakes, and is considered to be transported by the currents. pH was related to currents for one month only. Dissolved oxygen is independent of currents and requires information other than currents to explain the measured values. Probability techniques were successfully used to describe conductivity, pH and dissolved oxygen. (Knapp-USGS)
W71-07045

A COLORIMETRIC METHOD FOR AMMONIA IN NATURAL WATERS,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
J. E. Harwood, and A. L. Kuhn.
Water Research, Vol 4, No 12, p 805-811, December 1970. 7 p, 1 fig, 2 tab, 22 ref.

Descriptors: *Chemical analysis, *Water analysis, Colorimetry, *Nitrogen, *Ammonia, Pollutant identification, Trace elements, Water pollution, Water quality.
Identifiers: *Ammonia determination.

An improved phenol-hypochlorite method for determining ammonia in water uses nitroprusside as catalyst. The method is simple, sufficiently sensitive for low-level analyses and does not require accurate time intervals between reagents, nor expensive equipment. The method is well suited for routine use. Beer's Law was obeyed over the whole ammonia range investigated. Reproducibility was 1.3 percent with 10 micrograms N and 5.7 percent with 1 microgram N. (Knapp-USGS)
W71-07046

5B. Sources of Pollution

TRITIUM LOSS FROM WATER EXPOSED TO THE ATMOSPHERE,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Lab.
For primary bibliographic entry see Field 02K.
W71-06456

CONTINUOUS MONITORING OF WATER SURFACES FOR OIL FILMS BY REFLECTANCE MEASUREMENTS,
Shell Development Co., Emeryville, Calif.
For primary bibliographic entry see Field 05A.
W71-06459

DIELDRIN AND ENDRIN CONCENTRATIONS IN A LOUISIANA ESTUARY,
Ogden Coll. of Science and Technology, Bowling Green, Ky, and Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science; and Franklin Inst., Boston, Mass; and Riverside Research Labs., La Chasse, La.
D. R. Rowe, L. W. Canter, P. J. Snyder, and J. W. Mason.
Pesticides Monitoring Journal, Vol 4, No 4, p 177-183, March 1971. 7 p, 3 fig, 7 tab, 10 ref. PHS Grant No 1 RO 1 UI 00346-01.

Descriptors: *Estuaries, *Louisiana, *Dieldrin, *Endrin, *Pesticide residues, Bottom sediments, Water quality, Bioassay, Water pollution sources, Mississippi River.
Identifiers: *Mississippi River Delta.

The endrin and dieldrin concentrations were determined in water, bottom sediment, and oysters in an estuarine area of Louisiana. Sampling was conducted on approximately a semimonthly basis from October 1968 through May 1969 in Grand Bayou, Hackberry Bay, and Creole Bay. Creole Bay is about 14 miles above the Gulf of Mexico. Samples of oysters, sediment, and water were analyzed for residues of dieldrin and endrin using electron capture gas chromatography. Identification was made first on a nonpolar column and then on a polar column. The median concentration of dieldrin and endrin in oysters was 1.3 ppb and less than 1 ppb, respectively, while the maximum concentration was 3.4 ppb and 2.4 ppb. Water samples from all stations on every sampling date contained less than 1 ppb of both dieldrin and endrin; the highest level of dieldrin detected in the bottom sediment was 4 ppb, and the maximum concentration of endrin was less than 5 ppb. (Knapp-USGS)
W71-06460

CHLORINATED HYDROCARBON PESTICIDES IN IOWA RIVERS,
Iowa Univ., Iowa City. State Hygienic Lab.
Lauren G. Johnson, and Robert L. Morris.
Pesticides Monitoring Journal, Vol 4, No 4, p 216-219, March 1971. 4 p, 4 tab, 9 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Iowa, *Rivers, Dieldrin, DDT, Pesticide residues, Path of pollutants, Water pollution sources, Runoff, Mississippi River Basin.

The routine monitoring of a number of Iowa rivers for chlorinated hydrocarbon pesticides over a 3-year period has shown the presence of dieldrin, DDT, or DDE in the majority of the samples taken. Dieldrin has occurred more frequently and in higher concentrations than either of the other residues, and this is attributed to the amount of agricultural activity in the watersheds involved and to the amount of surface water runoff. (Knapp-USGS)
W71-06461

MONITORING ECOLOGICAL CONDITIONS ASSOCIATED WITH WIDE-SCALE APPLICATIONS OF DMA 2,4-D TO AQUATIC ENVIRONMENTS,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Research.
T. A. Wojtalik, T. F. Hall, and Larry O. Hill.
Pesticides Monitoring Journal, Vol 4, No 4, p 184-203, March 1971. 20 p, 4 fig, 14 tab, 12 ref, 4 append.

Descriptors: *Herbicides, *Pesticide residues, *Reservoirs, *Alabama, *Tennessee, Aquatic weed control, Water quality, Bioassay, Water pollution sources, Tennessee River, Tennessee Valley Authority Project.
Identifiers: Eurasian Milfoil, Nickajack Reservoir, Guntersville Reservoir.

Over 18,000 surface acres of Nickajack and Guntersville Reservoirs, Alabama and Tennessee, were treated with about 170,000 gallons of dimethlamine salt of 2,4-D during April-June 1969 to control invading Eurasian watermilfoil. The DMA 2,4-D was applied at the rates of 20 and 40 lb of 2,4-D acid equivalent per acre. Representative habitat types were selected and monitored for 2,4-D content in water, plankton, and sediment and for plankton species composition, distribution, abundance, change, and response. The treated water had no apparent effects on most marginal plants. No harmful response to the herbicide was observed in zooplankton, phytoplankton, benthic macroinvertebrates, or fish. Water continued to be used for domestic purposes without user complaints. Dimethlamine salt of 2,4-D appears to be noncumulative. Plankton sorbed large amounts and retained it for extended periods. Finished drinking water from municipal treatment plants on occasion contained 2,4-D. (Knapp-USGS)
W71-06462

THE DECOMPOSITION OF CRUDE OIL RESIDUES IN SAND COLUMNS,
Marine Lab., Aberdeen (Scotland).
R. Johnston.
Journal Marine Biology Association of the United Kingdom, Vol 50, No 4, p 925-937, 1970. 13 p, 5 fig, 8 ref.

Descriptors: *Oily water, *Beaches, *Sands, *Biodegradation, Path of pollutants, Water pollution effects, Surf, Oxidation, Model studies, Laboratory tests.
Identifiers: *Oil spills, *Oily beaches.

Rates of oxygen uptake were measured at a range of depths in sand columns (1) without oil, (2) heavily oiled and (3) lightly oiled. Oxygen change in presence of oil indicates the response of the microbial population and provides an estimate of the rate of biological degradation of the crude oil. Breakdown is dominated by oxygen availability but nutrients contribute as auxiliary oxygen sources. Oxygen removal indicates initial rates of oxidation of oil at 10 deg C ranging from 0.09 g oil per sq m per day for heavily dosed sand to 0.04 g oil per sq m per day for lightly dosed sand. These rates are applicable over periods of several months, thereafter the remaining oil, about 90%, decays immeasurably slowly. (Knapp-USGS)
W71-06492

GEOHYDROLOGY OF THE SHALLOW AQUIFERS OF BATON ROUGE, LOUISIANA,
Louisiana State Univ., Baton Rouge. Water Resources Research Inst.
For primary bibliographic entry see Field 02F.
W71-06505

INORGANIC PHOSPHATE TRANSFORMATION IN WATERLOGGED SOILS,
Louisianna State Univ., New Orleans.
I. C. Mahapatra, and W. H. Patrick, Jr.
Soil Science, Vol 107, No 4, p 281-288, 1969. 8 p, 5 fig, 2 tab, 10 ref.

Descriptors: *Water pollution sources, *Soil treatment, *Saturated soils, *Phosphates, *Louisiana, Ionization, Soils, Ion exchange, Soil-water-plant relationships, Inorganic compounds, Testing, Methodology, Test procedures, Soil analysis, Water quality, Soil water, Soil types, Acidic soils, Akaline soils, Soil properties, Fertilizers, Crops, Rice.
Identifiers: Waterlogged soils.

The distribution of various forms of soil phosphate in each of 16 soil types both before and after two months of waterlogging was studied. The more acid soils had a larger fraction of their inorganic phosphate in the forms of aluminum phosphate and iron phosphate while calcium phosphate was highest in the less acid soils. Aluminum phosphate increased as a result of waterlogging in most of the soils. In the finer textured soils, however, aluminum phosphate generally decreased as a result of waterlogging. As an average for all soils, there was an approximate 35% increase in aluminum phosphate due to waterlogging. Iron phosphate also increased as a result of waterlogging in all soils except the Commerce. The average increase was 64%. Part of the increase in iron phosphate was apparently at the expense of reductant soluble iron phosphate although, in the Commerce and two other recent alluvial soils, part of the increase in iron phosphate apparently came from calcium phosphate. (Woodard-USGS)
W71-06512

MOVEMENT OF 2,4-D IN SOILS,
New Mexico Agricultural Experiment Station, University Park.
H. E. Dregne, S. Gomez, and W. Harris.
New Mexico Agricultural Experiment Station Western Regional Research Project Progress Report, November 1969. 35 p, 21 fig, 8 tab, 41 ref.

Descriptors: *Water pollution sources, *Herbicides, *New Mexico, *Soil water movement, Groundwater, Surface waters, Testing, Test procedures, Methodology, Water quality, Soils, Pesticides, Chromatography, Adsorption, Chemical analysis, Analytical techniques, Bioassay, Soil structure, Infiltration, Soil properties, Leaching, Path of pollutants.

Movement of 2,4-dichlorophenoxyacetic acid (2,4-D) in three soils was studied to determine the extent to which herbicides applied in the field enter the surface and groundwater systems. Analytical techniques used included gas chromatography, thin layer chromatography, soil thin layer chromatography, resin thin layer chromatography, bioassays, and autoradiography. Primary emphasis was placed upon the effect of exchangeable cations on 2,4-D movement. Adsorption isotherms, breakthrough curves, leaching studies, and bioassays indicate that 2,4-D in the acid or salt form, is only slightly adsorbed by soil particles. It is easily leached if the soils are permeable. Virtually 100% of applied 2,4-D was recovered from a sandy loam in six and one-half hours of leaching. Only 38% was recovered from a slowly permeable silty clay loam over a period of ten months. Degradation products of 2,4-D were leached as easily as 2,4-D itself. (Woodard-USGS)
W71-06514

THE PATUXENT RIVER, REPORT NO 4, PHYSICAL, CHEMICAL AND BACTERIOLOGICAL WATER QUALITY - SUMMER SURVEYS, 1964-1966,
Maryland Dept. of Water Resources, Baltimore. Div. of Water Quality Investigations.
James T. Allison.
Maryland Division of Water Quality Investigations Report, 1968. 70 p, 11 fig, 6 tab, 9 ref, 5 append.

Descriptors: *Water pollution sources, *Rivers, *Water quality, *Maryland, Industrial wastes, Domestic wastes, Data collections, Land use, Chemical analysis, Methodology, Streamflow, Discharge measurement, Runoff, Coliforms, Dissolved oxygen, Biochemical oxygen demand, Water temperature, Precipitation (Atmospheric), Dissolved solids, Turbidity, Color, Acidity.
Identifiers: *Patuxent River (Md).

Water-quality data obtained during the three summer surveys of 1964, 1965, and 1966 on a 21-mile stretch of the Patuxent River in Maryland are presented. Sampling stations were located between Rocky Gorge Reservoir and the John Hanson Highway (U.S. 50 and 301) crossing of the Patuxent River. Samples were examined regularly for 10 chemical, physical and bacteriological qualities of water which reflect the condition and capacity of the river to assimilate any wastes it receives. Flow measurements were made daily at three sampling stations. Emphasis is placed on dissolved oxygen (D.O.), biochemical oxygen demand (B.O.D.), coliform bacteria, and stream flow as the critical factors in the assessment of water quality. In 1966 serious degradation of water quality with respect to D.O. was noted throughout the lower 15 miles of the study area with maximum stress in the lower reaches where D.O. as low as 1.0 ppm was recorded. Stream flow, which is the greatest single factor controlling the overall waste-assimilative capacity of surface water, decreased from year to year. (Woodard-USGS)
W71-06516

WATER QUALITY MONITORING FIELD STUDIES,
For primary bibliographic entry see Field 05A.
W71-06569

FECAL COLIFORM CONCENTRATIONS IN STORMWATERS,
Robert A. Buckingham, and Roger P. Betson.
Paper presented at the Amer Geophys Union, Fifty-first Annual Meeting, 1970.

Descriptors: *Storm runoff, *Coliforms, *Overland flow, *Water quality, *Water pollution sources, *Testing.
Identifiers: *Fecal coliforms, *Tennessee Valley.

Recent limited stormwater bacteriological water-quality sampling in the Tennessee Valley indicates that high fecal coliform loads are common in stormwater runoff. In clean residential areas sustained high fecal coliform loads were observed during stormwater runoff. The source of these loads was associated with overland flow, and it appears that staggered contributing times account for the sustained high loads. High fecal coliform counts were also measured in stormwaters originating from agricultural areas and forested watersheds. The consistency with which fecal coliform counts in excess of accepted standards are commonly found further substantiates the need for a reappraisal of this test as an indicator of pathogenic organisms. These data also point to the importance of recognizing the streamflow regime in the analysis of water-quality sampling data since observations taken during storm periods usually in high bacteriological loads.
W71-06570

SEASONAL VARIATIONS IN SURVIVAL OF INDICATOR BACTERIA IN SOIL AND THEIR CONTRIBUTION TO STORMWATER POLLUTION,
D. J. Van Donsel, E. E. Geldreich, and N. A. Clarke.
Appl Microbiol, Vol 15, No 6, p 1362-1370, 1967.

Descriptors: Streptococcus, E. coli, Bioindicators.
Identifiers: Seasonal survival study.

A three-year study was made on the survival of selected strains of Escherichia coli and Streptococcus faecalis in shaded and exposed out-door soil plots. The soils were dosed periodically, and subsequent reductions in survival are shown graphically as seasons variate. Periods for 90-per cent reduction of Esch. coli ranged from 3.3 days in summer to 13.4 days in autumn and for S. faecalis from 2.7 days in summer to 20.1 in winter. During the fall, the survival periods for the organisms were the same, but in spring and winter Streptococcus survived longer. Both organisms could be isolated from runoff during period of heavy rainfall in spring; however, isolation during summer and autumn months was sporadic. On account of these results and other factors, it was considered that Esch. coli was the better indicator of pollution.
W71-06571

THE BACTERIOLOGICAL ASPECTS OF STORM-WATER POLLUTION,
E. E. Geldreich, L. C. Best, B. A. Kenner, and D. J. Van Donsel.
Journal Water Pollution Control Federation, Vol 40, No 11, p 1861-1872, Nov 1968.

Descriptors: *Water pollution sources, *Pollutant identification, Remedies.
Identifiers: *Fecal coliforms.

The bacteriological composition of stormwater from a variety of areas was compared and seasonal differences noted. Higher numbers of organisms appear to persist during winter than during summer. The fecal coliform segment of the total coliform population for all stormwater samples averaged 8.6 percent; however, 21.1 percent fecal coliforms were observed in stormwater taken in autumn from a suburban business district. Evidence indicates that fecal contamination in separate stormwater systems originates from cat and dog deposits on soil and from rodent deposits in urban areas. Thus, regulations to prohibit pets on public beaches and improved garbage control plans to discourage rodent proliferation are recommended. Also, diversion of storm drains and land drainage away from beaches and reservoirs would aid in reducing bacterial contamination.
W71-06572

ON SIGNIFICANCE OF PSEUDOMONAS AERUGINOSA IN SURFACE WATERS,
A. W. Hoadly.
Journal of the New Eng Water Works Association, Vol 82, No 2, p 99-111, Jun 1968.

Descriptors: *Pseudomonas, *Drainage, Indicators.
Identifiers: *Pseudomonas aeruginosa.

Although sewage discharges represent major potential sources of P. aeruginosa in the environment, storm drainage from municipal areas contributes continuous inoculum to surface waters. Farm drainage also can contain small numbers of bacteria under certain conditions. Relatively heavy populations of P. aeruginosa in streams below sewage outfalls decrease rapidly as they progress downstream. The usefulness of this organism as an indicator of the possible presence of enteric pathogens is therefore limited.
W71-06573

THE OCCURRENCE AND BEHAVIOR OF PSEUDOMONAS AERUGINOSA IN SURFACE WATERS,
A. W. Hoadley.
Thesis, University of Wisconsin, 1967, Diss Abstr, Vol 28B, p 459-460, 1967. 224 p.

Descriptors: *Pseudomonas, *Indicators, *Storm runoff, *Water pollution sources, *Surface waters, Drainage, Sewage.
Identifiers: *Pseudomonas aeruginosa.

Studies on the ecology of Pseudomonas aeruginosa in surface and tap waters and on its usefulness as an indicator of pollution showed that Pseudomonas probably does not occur in waters unaffected by the activities of man and domestic animals. Although farm drainage and storm runoff from urban areas contribute small numbers of Pseudomonas, sewage discharges probably represent the major source of these organisms entering streams, particularly discharges of crude sewage which may contain up to 700,000 organisms per 100 ml. Although secondary sewage treatment reduces the number of Pseudonomas in domestic sewage by about 99 per cent, growth of the organism has been observed during treatment of slaughterhouse waste waters. Populations of less than 100 per 100 ml occurred in surface waters near areas of human activity but not directly receiving sewage discharges; however, populations of about 100 per 100 ml were detected in public bathing waters in the Madison Lakes, Wis., and very much greater populations were observed in waters recently contaminated with sewage. Although some sterile natural waters supported growth of Pseudonomas in the laboratory, populations of viable Pseudonomas were reduced rapidly in natural surface waters, with reductions of more than 90 percent in three hours. It is concluded that Pseudonomas aeruginosa is a sensitive indicator of pollution of surface waters by sewage and by runoff from urban areas and farmyards.
W71-06574

ASSESSING THE QUALITY OF URBAN DRAINAGE,
Warren Viessman, Jr.
Public Works, Vol 100, No 10, p 89-92, Oct 1969.

Descriptors: *Urbanization, *Runoff, *Water quality, Storm runoff, Pollutant identification.
Identifiers: *Sediment.

Recommendations are made for further study in the area of identifying sources and constituents of urban runoff through the development and testing of urban water quality models and through the national collection of urban water quality data. Possible sources of pollutants and constituents of stormwater runoff are described with emphasis on a primary pollutant, sediment. Approaches to the development of water quality models are discussed.
W71-06575

WATER POLLUTION -- COAST TO COAST.
For primary bibliographic entry see Field 05G.
W71-06633

URBAN RUNOFF ADDS TO WATER POLLUTION.

Environ Sci Technol, Vol 3, No 6, p 527, Jun 1969.

Descriptors: *Runoff, *Data collections, *Cost analysis, *Surveys, *Separation techniques, Rainfall, Overflow, Biochemical oxygen demand.
Identifiers: *Urban runoff, *Chicago, Combined sewers.

An APWA survey indicated that: (1) urban runoff constitutes approximately 1% of the raw sewage load which amounts to 5% of the BOD discharged from the area's secondary waste treatment facilities; (2) water pollution from this urban source occurs creating a shock pollution load on receiving waters; (3) the most determinable measure of pollution potential of street litter is the BOD load of the soluble dust and dirt fraction; (4) an estimated expenditure of $48 billion would be needed to

eparate sanitary and storm waters; and, (5) $15 illion would be needed for alternate control ethods for abatement of combined sewer over-ows.
/71-06634

TATUS AND PROPOSED CONTROL OF POL-UTION IN BOSTON HARBOR AND ITS RIBUTERIES,
or primary bibliographic entry see Field 05G.
/71-06649

/ATER QUALITY AT PATUXENT RIVER RIDGE, MARYLAND - JANUARY 1968 HROUGH NOVEMBER 1969,
eological Survey, Arlington, Va.
or primary bibliographic entry see Field 05A.
/71-06664

ADIOCHEMICAL ANALYSES OF WATER ROM WELLS, SPRINGS, AND STREAMS IN ENTRAL NEVADA,
eological Survey, Denver, Colo.
. J. Schroder, W. A. Beetem, and Edward illasana.
vailable from the National Technical Information ervice as USGS-474-97, $3.00 paper copy; icrofiche $0.95. Geological Survey Report SGS-474-97, 1971. 24 p, 1 fig, 1 plate, 2 tab, 1 ef. USAEC Agreement No. AT (29-2)-474.

escriptors: *Path of pollutants, *Fallout, Nuclear explosions, *Groundwater, *Nevada, adioactive wastes, Water pollution sources, Data ollections, Hydrologic data, Tritium, Radioactivi-, Radioisotopes, Sampling, Monitoring.
dentifiers: *Groundwater radioactivity.

his report presents the radiochemical data from ne central Nevada study area obtained for and nalyzed by the U.S. Geological Survey between lay 1967 and June 1970. The study area from hich samples are reported is in Eureka, Lander, ye, and White Pine Counties, Nevada. The results f tritium analyses, gross alpha and gross beta nalyses are tabulated. (Knapp-USGS)
/71-06669

HE QUANTITY AND QUALITY OF SEDI-IENTS DEPOSITED IN CLEVELAND HARBOR T CLEVELAND, OHIO,
orps of Engineers, Chicago, Ill.
or primary bibliographic entry see Field 02J.
/71-06679

HE ROLE SEDIMENTS PLAY IN DETERMIN-NG THE QUALITY OF WATER,
orps of Engineers, Omaha, Nebr. Hydro-Sedi-ent Section.
or primary bibliographic entry see Field 02J.
/71-06680

ADIOACTIVE CESIUM IN ESTUARIES,
laval Ordnance Lab., Silver Spring, Md. Nuclear hysics Div.
ordon K. Riel.
adiological Health Data and Reports, Vol 11, No 2, p 659-665, December 1970. 7 p, 2 fig, 8 tab, 7 ef.

escriptors: *Fallout, *Cesium, *Estuaries, Path of ollutants, Water pollution sources, Radioisotopes, lass transfer, Water pollution control, Sediment ransport, Tracers, Tracking techniques.
dentifiers: *Chesapeake Bay, *Cesium adioisotopes.

he concentration of dissolved cesium-137 from allout in the Chesapeake Bay is on the order of 0.3 Ci/liter, while the concentration is less than 0.1 Ci/liter in the rivers and ocean that supply the ay's water. The ratio of radiocesium concentra-ion to salinity in the Bay is fairly independent of lo-cation and season. Brief studies elsewhere indicate that this pattern is typical of estuaries. (Knapp-USGS)
W71-06702

FISHERY MANAGEMENT PROGRAM, EXPANDED PROJECT FOR AQUATIC PLANT CONTROL-FIELD TEST AREAS - FINAL REPORT.
Bureau of Sport Fisheries and Wildlife, Atlanta, Ga. Div. of Fishery Services.
For primary bibliographic entry see Field 05C.
W71-06703

SYMPOSIUM ON SEA-LEVEL CANAL BIOENVIRONMENTAL STUDIES.
Battelle Memorial Inst., Columbus, Ohio.

Available as BMI-171-28 from NTIS, Springfield, Va 22151, $3.00 printed copy, $0.95 microfiche. Martin, William E., Editor. Proceedings of the 19th Annual Meeting of American Institute of Biological Sciences, September 4-5, 1968, Ohio State University, Columbus: Battelle Memorial Institute, Columbus Laboratories, April 21, 1969. 196 p. USAEC Contract No AT (26-1)-171.

Descriptors: *Panama Canal, *Nuclear engineering, *Nuclear explosions, *Excavation, *Canals, Water pollution sources, Ecology, Fallout, Radioactivity, Public health.
Identifiers: *Panama, *Nuclear excavation.

Bioenvironmental studies were made to help judge the radiological-safety feasibility of nuclear-excavation plans for the construction of a sea-level canal across the isthmian region of Central America. As part of the program to predict potential external and internal radiation doses to human populations living in the vicinity of the proposed sea-level canal routes, extensive field studies of human, agricultural, terrestrial, freshwater, and marine ecology were made in eastern Panama and northwestern Colombia. An ecological model shows radionuclide transfer through food chains and other environmental pathways leading to man. The model provides calculations of the kinds and quantities of radionuclides to be expected, during and after nuclear excavation, in the external environments and diets of populations in the two study areas. Estimates of potential radiation doses to man will be based on these calculations. (See also W71-06715 thru W71-06718) (Knapp-USGS)
W71-06714

RADIONUCLIDE PRODUCTION FOR THE NUCLEAR EXCAVATION OF AN ISTHMIAN CANAL,
Battelle Memorial Inst., Columbus, Ohio.
James R. Vogt.
In: Symposium on Sea-Level Canal Bioenvironmental Studies. Paper 2, April 21, 1969. 6 p, 4 tab.

Descriptors: *Panama Canal, *Nuclear engineering, *Nuclear explosions, *Excavation, *Canals, Water pollution sources, Ecology, Fallout, Radioactivity, Public health.
Identifiers: *Panama, *Nuclear excavation.

The preliminary concept for the construction of a sea-level canal using nuclear explosives is discussed with reference to the number and sizes of nuclear devices that may be required and the characteristics of these devices. The factors affecting radionuclide production and distribution are described along with some recent nuclear experiments conducted by the U. S. Atomic Energy Commission to provide technical data on cratering mechanisms and special emplacement techniques which could minimize the release of radioactivity to the atmosphere. The quantities of radioactivities which would be released into the cloud and local fallout for major excavation projects, using nuclear technology which can reasonably be expected to be available sometime in the future, are presented for a representative set of radionuclides. (See also W71-06714) (Knapp-USGS)
W71-06715

THE RETENTION OF SELECTED RADIONUCLIDES FROM DILUTE SOLUTIONS BY PANAMANIAN CLAYS,
Florida Univ., Gainesville. Dept. of Environmental Engineering; and Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
William A. Goldsmith, W. Emmett Bolch, and J. F. Gamble.
In: Symposium on Sea-Level Canal Bioenvironmental Studies, Proceedings of the 19th Annual Meeting of American Institute of Biological Sciences, September 4-5, 1968, Ohio State University, Columbus. Battelle Memorial Institute, Columbus Laboratories, Paper 12, April 21, 1969. 6 p, 3 fig, 1 tab.

Descriptors: *Adsorption, *Radioisotopes, *Fallout, *Path of pollutants, *Soil water movement, Clays, Clay minerals, Leaching, Ion transport, Panama Canal, Nuclear engineering, Nuclear explosions, Excavation.
Identifiers: *Panama, *Nuclear excavation.

The retention of the radionuclides Ca-45, Sr-89, Cs-137, and Rb-86 was determined for six selected Panamanian clays. The procedure used was that of a slurry test. Gamma emitters were counted by gamma spectroscopy; beta emitters were counted by liquid scintillation. The data have been plotted in a linearized version of the usual uptake or removal curves. The results indicate that all clays used have an ultimate uptake capacity of practically 100% of the applied radionuclides. However, the rate of uptake is markedly different for the various clays. A correlation between the rate of uptake and various clay properties is now being investigated. (See also W71-06714) (Knapp-USGS)
W71-06716

HYDROLOGIC REDISTRIBUTION OF RADIONUCLIDES AROUND A NUCLEAR-EXCAVATED SEA-LEVEL CANAL,
Isotopes, Inc., Palo Alto, Calif.
R. L. Charnell, T. M. Zorich, and D. E. Holly.
In: Symposium on Sea-Level Canal Bioenvironmental Studies, Proceedings of the 19th Annual Meeting of American Institute of Biological Sciences, September 4-5, 1968, Ohio State University, Columbus. Battelle Memorial Institute Columbus Laboratories, Paper 15, April 21, 1969. 12 p, 4 fig, 9 ref.

Descriptors: *Panama Canal, *Nuclear engineering, *Nuclear explosions, *Excavation, *Canals, Water pollution sources, Ecology, Fallout, Radioactivity, Public health.
Identifiers: *Panama, *Nuclear excavation.

The hydrologic redistribution of radionuclides deposited in the environment following nuclear excavation of a sea-level canal are discussed. Additionally, a simple comprehensive numerical model is presented by which estimates of the rates of removal of radionuclides from deposited fallout and from the ejecta and fallback can be made. Following a nuclear cratering explosion, a spectrum of rock fragments which contain radioactivity as fission and activation products will surround the excavation area. Dust and fine particles will be deposited further out as wind and base-surge distributed fallout. Following the initial deposition of radionuclides, redistribution will be accomplished primarily by the movement of water. Radioactive products may be moved from the initial point of deposition both as particles containing radioactive isotopes and as dissolved radionuclides leached from rubble and fallout material. Radioactive products may be moved either by surface or groundwater. (See also W71-06714) (Knapp-USGS)
W71-06718

A KINETIC MODEL OF FISH TOXICITY THRESHOLD,
California Univ., Berkeley. Dept. of Civil Engineering.

For primary bibliographic entry see Field 05C.
W71-06734

INFLUENCE OF PESTICIDE RUN-OFF IN MONTEREY BAY,
Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W71-06742

TARGET DATES FOR SECONDARY TREATMENT AND STORMWATER SEPARATION ON LOWER MISSOURI AND MISSISSIPPI RIVERS,
For primary bibliographic entry see Field 05D.
W71-06744

A PLAN FOR ENDING LAKE ERIE POLLUTION,
For primary bibliographic entry see Field 05G.
W71-06747

POLLUTION OF THE CHAO PHRAYA RIVER,
R. E. Leffel.
J Sanit Eng Div, Am Soc Civil Engrs, Vol 94, No SA2, p 295-306, Apr 1968.

Descriptors: *Foreign research, Estuaries, Waste water treatment, Water pollution sources.
Identifiers: *Chao Phraya River, Thailand.

Programmed sampling and tests of the Chao Phraya River Estuary show that its pollution-receiving capacity is limited. No sewage collection system presently exists in Bankgok, but separate waste water and stormwater systems are being planned because a combined system would undoubtedly cause further pollution of the estuary during severe rainfall. More studies must be made before the degree of oxidation of organic carbon, nitrogen, and amoniacal nitrogen can be accurately determined. Further studies are also being conducted to decide upon the necessary type of initial waste water treatment. Such treatment must include sufficient oxidation of organic carbonaceous substances and oxidizable nitrogenous substances. This study also demonstrates the need for modifications in standard BOD measurements in addition to modifications of the parameters and equations defining DO concentrations for tropical estuaries.
W71-06748

WATER RESOURCES AS AN ELEMENT OF URBAN PLANNING,
M. L. Rockwell.
J Urban Planning Devel Div, Am Soc Civil Engrs, Vol 94, No UPI, p 1-9, Aug 1968.

Descriptors: *Water utilization, *Storm runoff, Reservoir storage, *Urbanization, Waste water treatment, Water pollution sources.

An examination is made of the complex technical, legal, and administrative problems involved in northeastern Illinois' water situation and the high degree of use and reuse taking place in this area. Even stormwater runoff along with its pollutants is retained in reservoirs to be used later beneficially. Existing problems related to stormwater runoff in this area include the restriction of water infiltration and, thus, the production of increased runoff caused by the construction of impermeable surfaces (roof tops, streets, and parking lots), and the maintenance of unsightly stormwater basins in areas where water recreational facilities are needed.
W71-06753

ESTABLISHMENT OF WATER QUALITY STANDARDS IN THE CITY OF TAKAMATSU,
For primary bibliographic entry see Field 05G.
W71-06767

STANDARDS FOR EFFLUENTS IN SWITZERLAND,
Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
For primary bibliographic entry see Field 05G.
W71-06792

DEAD ANIMALS AND HOW THEY CONTRIBUTE TO POLLUTION OF THE ENVIRONMENT,
Department of Agriculture, Madison, Wis.
For primary bibliographic entry see Field 05G.
W71-06815

WATER QUALITY PROBLEMS,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05G.
W71-06816

FUTURE TRENDS IN LIVESTOCK PRODUCTION,
Wisconsin Univ., Madison. Coll. of Agriculture.
For primary bibliographic entry see Field 05G.
W71-06817

WHAT AND WHERE ARE THE CRITICAL SITUATIONS WITH FARM ANIMAL WASTES AND BY-PRODUCTS IN WISCONSIN,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05G.
W71-06818

A COMPREHENSIVE SURVEY OF INDUSTRIAL WASTE POLLUTION IN SOUTH CAROLINA,
Texas A and M Univ., College Station.
Roy W. Hann, Jr., and F. D. Callcott.
Proceedings, Twentieth Industrial Waste Conference, May 4-6, 1965, Purdue University, Lafayette, Ind, p 538-550, July 1965. 8 fig, 1 tab, 7 ref.

Descriptors: *Industrial wastes, Biochemical oxygen demand, *South Carolina, Cotton, Textiles, Waste water treatment.
Identifiers: *Cotton wastes, Slashing wastes, *Wool scouring, Dyehouse wastes, *Textile mill wastes, Man-made fiber plants, Desizing.

The nature and magnitude of pollutants being discharged into South Carolina rivers by each industrial group, the location of the discharges, and the industrial processes that give rise to such waste discharges are summarized in this paper. In inland streams textiles contribute 10 times the pollutional load of its nearest competitor, the pulp and paper industry. Cotton wastes, presenting the major pollution problem, come from fiber preparation, bleaching, and finishing. Some wastes are directly toxic to aquatic life; high biochemical oxygen demand is indirectly toxic. Only 10% of the grey goods manufacturers in South Carolina treat their wastes in any way, and few finishing plants separate their process wastes for treatment. Wool processing wastes come primarily from the scouring chain. Those synthetic fibers made of natural substances cause more pollution than do nylon, orlon, or fiberglass - non-natural fibers. (Sheffield-North Carolina State University)
W71-06927

THERMAL EFFECTS AND NUCLEAR POWER STATIONS IN THE USA,
Argonne National Lab., Ill.
D. Miller, J. V. Tokar, and R. E. Nakatani.
Available from NTIS as CONF-700810-30, $3.00 in paper copy, $0.95 in microfiche. Conference paper CONF-700810-30 (IAEA-SM-146/30), 1970. 14 p.

Descriptors: *Nuclear power plants, *Water temperature, *Ecosystems, *Cooling water, Heated water.
Identifiers: *Steam power plants.

Steam-electric stations discharging heated co
denser cooling water into public waters will modi
the aquatic environment. There is no question th
some changes will occur, but the biologic
problem is to determine the degree of change
both short-term and long-term, the extent of the
changes, and to determine if they significantly a
fect water uses. Pressing biological problems a
identified and needed research and developme
are recommended. Examples of problems co
sidered are as follows: (1) Compliance with wat
temperature standards. (2) Lack of definition
mixing zones. (3) Lack of approved state wat
temperature standards. (4) Predicting temperatu
distributions in receiving water. (5) Assessment
biological changes. (6) Design of intake and outfa
structures to minimize biological damage -- fi
protection facilities. (7) Nuisance growth of plan
and algae. (8) Sublethal effects of temperature c
aquatic life.
W71-06932

MOLECULAR PHYSICS OF THE SEA, PAR VIII,
Naval Research Lab., Washington, D.C.
V. V. Shuleikin.
Available from NTIS as AD-711 952, $3.00 i
paper copy, $0.95 in microfiche. NRL Translatio
No 797, 1960. 40 p. Excerpt from the book (p 78
819) entitled: Fizika Morya, Part VIII, beginnin
with Section No 10, Surface Active Films on th
Sea, 3rd edition, Izdatel'stva Akademii Naul
SSSR, 1953, Moscow. 989 p.
Identifiers: *Oceans, *Films, *Oils, *Water pollu
tion, *Surface-active substances, Oceans, *Wat
waves (Damping), Surface properties, Drift, Ocea
waves, Absorption, Test methods, Surface tensio
Salinity, USSR, *Oil pollution, Translations.

The report discusses the damping of ocean wave
by films. The films discussed are both from oil c
surface active substances. Also the surface tensio
of these films was studied in relation to the ocean
salinity.
W71-06938

DON'T POLLUTE A CLEAN RESERVOIR.
Oil and Gas Journal, Tulsa, Okla.

Oil and Gas Journal, November 16, 196
(Reprint). 2 p, 2 tab.

Descriptors: *Bacteria, *Water wells, Drilling
Sulfate-reducing bacteria, Iron bacteria, Drillin
fluid, Corrosion, *Oil industry, Surfactants, Dete
gents, *Bactericides.
Identifiers: *Microbiological contamination, Ce
ment filtrate, Hydraulic fracturing fluid, Cationi
quaternary, Alkylbensyl-trimethyl ammoniu
chloride, Clay swelling.

Bacterial contamination of a producing well fro
drilling mud or fracture fluid has been overlooke
for many years in spite of our knowledge of bac
teria in connection with waterflooding operation
But the problem has finally been recognized, an
remedial action can be taken, if the right chemica
are used. Producing formations in wells drilled fo
the production of oil, gas, or water, are all subjec
to contamination because of contact with drillin
fluid, cement filtrate, and hydraulic fracturin
fluid. Most trouble in contamination cases can b
traced to one or two sources - sulfate-reducing bac
teria, or iron bacteria. Both of these are capable o
reducing permeability of a producing formatio
through deposition of their by-products, or throug
their presence in extremely large numbers. Havin
recognized the problem, the next step was to find
chemical that would solve it. After testing man
chemicals, it was found that a cationic quaternar
alkylbenzyl trimethyl ammonium chloride, wa
most effective. It is a bactericide. It behaves as
corrosion inhibitor because of its film-forming pro
perties. Its detergent properties aid in preventin
clay swelling, and it is a nonemulsifier. (Campbel
NWWA)
W71-06943

ABORATORY STUDY OF THE BEHAVIOR OF SANITARY LANDFILL,
rexel Univ., Philadelphia, Pa.
. A. Fungaroli, and R. L. Steiner.
ournal Water Pollution Control Federation, Vol 3, No 2, p 252-267, February 1971. 16 p, 20 fig, 3 b, 12 ref. USPHS Grant No 5-R01-UI00516.

escriptors: *Landfills, *Hydraulic models, Lysimeters, *Leaching, *Water pollution sources, arbage dumps, Sanitary engineering, Infiltration, oil water movement, Path of pollutants.
entifiers: Sanitary landfills.

he design and operation of a simulated sanitary ndfill is described. The behavior of the model, a simeter, is best described as an aerobic state, followed by an anaerobic state. Sustained high pollution levels were measured in the leachate, with OD levels at approximately 20,000 mg/liter. (K-app-USGS)
71-07011

IGNOSULPHONATES IN LAKE PAIJANNE ATER,
elsinki City Waterworks (Finland). Construction ept.
ppo Priha.
SCE Proceedings, Journal of the Sanitary Engineering Division, Vol 97, No SA2, Paper 8021, p 91-207, April 1971. 17 p, 6 fig, 2 tab, 12 ref.

escriptors: *Water pollution sources, *Lakes, Pulp wastes, *Sulfite liquors, Water treatment, ater quality, Water pollution, Water supply, Industrial wastes, Wood wastes, Organic wastes, Sulnates.
lentifiers: Lake Paijanne (Finland), Finland.

he water requirements of the city of Helsinki and s adjacent urban areas can be satisfied from the resent sources up to about 1978. In order to meet he demand from the 1980's on, water will be conveyed to Helsinki in a 120-km long rock tunnel om the southern end of Lake Paijanne, the cenal lake of the Kymi River basin. The total volume f the lake is approximately 17.3 billion cu m as easured from mean water level. Industrial and omestic waste waters are released into the lake nd water courses empty into it. These wastes are ostly made up of the effluents of pulp mills and he spent liquor from the cooking processes. The gnosulphonic acids in these wastes have spread ore or less over the whole lake and form an imortant factor in judging its water quality and suitaility as a supply for drinking water purification. he Water Examination Bureau at the Helsinki ity Waterworks has carried out water quality stuies on the lake since 1965. These studies include easuring lignosulphonate content at sampling staons in central and southern parts of the lake and arallel pilot plant treatment runs with Lake aijanne water and water from the present raw ater supply. (Knapp-USGS)
71-07027

HE INFLUENCE OF DECOMPOSING SALMON ON WATER CHEMISTRY,
laska Univ., College. Inst. of Water Resources.
ohn J. Goering, and David C. Brickell.
vailable from National Technical Information ervice as PB-198 431, $3.00 in paper copy, $0.95 n microfiche. Alaska Institute of Water Resources, ollege, Report No. IWR-12, 1971. 27 p, 7 fig, 3 ab, 8 ref. OWRR Project B-014-ALAS (1).

escriptors: *Salmon, Estuarine environment, Nutrients, Alaska, *Decomposing organic matter, Organic wastes, Industrial wastes, Water pollution ources, Ammonification, Nitrification.
dentifiers: Iliuliuk Bay (Alas).

he chemical dynamics of sea food waste decomposition and of salmon decomposition in a marine ystem were studied. A drastic increase in NH4 (..)-N and decrease in 02 occurred in the marine bay Iliuliuk Bay, Unalaska Island, Alaska) receiving ea food processing wastes. A seaward decreasing but elevated NH4 (..)-N suggests that this bay influences the nitrogen economy of the adjacent ocean. Salmon carcasses decomposition was followed in a spawning stream and its associated estuary (Little Port Walter, Alaska). Concentrations of NH4 (..)-N and organic -N in the water were determined in this system weekly, beginning before spawning and ending several months later. NH4 (..)-N and dissolved organic -N in the stream and estuary were low and unvariable before spawning. During spawning, NH4 (..)-N and organic -N increased downstream. As carcasses increased the NH4 (..)-N and organic-N became greater. Large increases of organic -N in the stream and estuary also resulted from salmon decomposition.
W71-07057

5C. Effects of Pollution

MONITORING ECOLOGICAL CONDITIONS ASSOCIATED WITH WIDE-SCALE APPLICATIONS OF DMA 2,4-D TO AQUATIC ENVIRONMENTS,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Environmental Research.
For primary bibliographic entry see Field 05B.
W71-06462

AN OIL DISPERSANT'S EFFECT ON THE MICROFLORA OF BEACH SAND,
Washington Univ., Seattle, Wash. Dept. of Zoology.
Stephen A. Bloom.
Journal Marine Biology Association of the United Kingdom, Vol 50, No 4, p 919-923, 1970. 5 p, 2 fig, 5 ref. NIH Grant.

Descriptors: *Oily water, *Water pollution control, *Water pollution treatment, *Detergents, Biodegradation, Water pollution effects, Beaches, Sands.
Identifiers: *Oil spills, *Oil-spill cleanup, Corexit 7664.

The effects of 'Corexit 7664', an oil dispersant, alone and in combination with oil in sand columns were determined by oxygen uptake, C-14 uptake, and chlorophyll analysis. 'Corexit' had no obvious deleterious effects within the experimental system under the conditions of periodic and continuous additions ranging from 500 ppm to 100,000 ppm and in combination with Kuwait crude oil. No change was observed in chlorophyll or C-14 uptake. Heightened oxygen uptake was noted for continuous addition of 'Corexit', for the oil control, and for oil plus 'Corexit'. Caloric content of the oil and oxygen uptake indicated an extended degradation period. (Knapp-USGS)
W71-06491

THE DECOMPOSITION OF CRUDE OIL RESIDUES IN SAND COLUMNS,
Marine Lab., Aberdeen (Scotland).
For primary bibliographic entry see Field 05B.
W71-06492

ON THE STAGNATION AND RECENT TURNOVER OF THE WATER IN THE BALTIC,
Fishery Board of Sweden, Goteborg. Hydrographic Department.
Stig H. Fonselius.
Tellus, Vol 22, No 5, p 533-544, 1970. 12 p, 13 fig, 3 ref.

Descriptors: *Eutrophication, *Salinity, *Density stratification, *Water circulation, *Water balance, Hydrologic budget, Nutrients, Turnovers, Water pollution effects, Path of pollutants.
Identifiers: *Baltic Sea.

The hydrography and water balance of the Baltic are described. Nutrients accumulate through runoff and decay of organic matter in the deep stagnant water, supplying the surface with organic matter, ammonia, nitrogen, and hydrogen sulphide. Oxygen has decreased in the Baltic deep water during the present century. An increased primary production in the surface water is predicted and a prognosis for the future development of the oxygen conditions in the Baltic is given. It is concluded that Man has increased the oxygen utilization in the deep water by the enormously increased discharge of untreated waste water from industries and communities and that the Baltic therefore has been 'overstrained.' Measures against future waste discharge must be taken to give the Baltic a chance to recover. (Knapp-USGS)
W71-06498

THE EFFECTS OF THERMAL LOADING AND WATER QUALITY ON ESTUARINE PRIMARY PRODUCTION,
Maryland Univ., Solomons. Natural Resources Inst.
David A. Flemer, D. Heyward Hamilton, Carolyn W. Keefe, and Joseph A. Mihursky.
Available from NTIS as PB-198 304, $3.00 in paper copy, $0.95 in microfiche. Natural Resources Institute Reference No 71-6, December 1970. 217 p, 67 fig, 54 tab, 277 ref. OWRR Project C-1401 (No 1979) (2).

Descriptors: *Water quality, *Thermal pollution, *Estuarine, *Phytoplankton, *Primary productivity, *Copepods, Maryland, Environment, Marine bacteria, Secondary productivity, Cycling nutrients, Photosynthesis, Eutrophication, Carbon cycle, Carbonates, Carbohydrate, Chlorophyll, Seston, Organic matter, Proteins, Carbon, Nitrogen, Nitrogen cycle, Nitrates, Nitrites, Ammonia, Phosphates, Phosphorus compounds, Dissolved oxygen, Salinity, Light penetration, Turbidity, Marshes, Freshwater marshes, Tidal marshes, Salt marshes, Rooted aquatic plants, Wild rice, Plant growth substances, Heated water, Thermal power plants, Electric power.
Identifiers: *Chesapeake Bay, *Patuxent River, Acetone, Cattail, Spartina, Indoleacetic acid.

Data on the hydrography, nutrient chemistry, primary production, standing crops of phytoplankton and zooplankton, and the effects of entrainment on the phytoplankton-bacteria community by a power plant in the upper Patuxent estuary are reported for the period August 1968 to August 1970. Carbon-14 uptake by the plankton under constant light ranged from 0.1 to 598 mg/cu m hr. Chlorophyll a values ranged from 0.1 to 120 mg/cu m. Maximum chlorophyll a and productivity values were measured in the oligohaline reaches where the salinity gradient was strongest. Locations above and below this region exhibited lower values. Calculated primary production ranged from 0.01 to 5.77 g/sq cm day and the spacial pattern was inversely related to turbidity and the volumetric measurements of productivity. Maximum penetration of high nutrient levels into the estuary occurred during the winter. Nutrient concentrations were high and comparisons with earlier published data indicate accelerated rates of nutrient input. Published information on intake-effluent studies showed that the power plant can cause a significant reduction in the standing crop and photosynthetic rates of entrained organisms. The effects of chlorination on entrained organisms may be more important than those of heat. We did not observe measurable effects of entrainment in the open river near the power plant. Preliminary studies were made on the species composition, chemical content, biomass and production of marsh vegetation. The total production of all the marshes in the study area was estimated at 23.3 x 2 million 330 thousand kg dry matter year of which 23,100 kg was nitrogen and 3900 kg was phosphorus. The study extended biomass data on some important zooplankton species, e.g., Eurytemora affinis.
W71-06595

ENVIRONMENTAL IMPACT OF POWER PLANTS,
Corps of Engineers, Fort Belvoir, Va. Operations Div.

Robert E. Donovan.
The Military Engineer, Vol 63, No 411, p 5-8, January-February 1971. 4 p, 4 fig, 1 tab.

Descriptors: *Nuclear power plants, *Environmental effects, *Water pollution sources, *Pollutant identification, *Electric powerplants, Thermal pollution, Air pollution, Radioactivity effects, Environment, Oxides, Reviews, Fish, Aquatic life, Thermal powerplants.
Identifiers: *Conventional powerplants.

Along with the need for added electrical power comes an increase in the potential for environmental pollution. Environmental effects in the immediate vicinity of the plant during normal operation are considered in this report. Gneralizations are made concerning the relative adverse ecological effects of nuclear and conventional power plants. Conventional plants cause less radioactive pollution, but radioactive releases are under strict control and their effect on the environment appears to be minimal. Conventional plants have a decided short-term advantage in thermal pollution. In those applications where thermal pollution of cold-water fisheries is critical, conventional plants have the advantage regardless of whether or not cooling towers and basins are used. This advantage probably will be largely eliminated in 5 to 10 years. (Woodard-USGS)
W71-06663

FISHERY MANAGEMENT PROGRAM, EXPANDED PROJECT FOR AQUATIC PLANT CONTROL-FIELD TEST AREAS - FINAL REPORT.
Bureau of Sport Fisheries and Wildlife, Atlanta, Ga. Div. of Fishery Services.

Bureau of Sport Fisheries and Wildlife Report, October 17, 1969. 88 p, 4 fig, 42 tab, 10 ref, append.

Descriptors: *Water pollution sources, *Herbicides, *North Carolina, *Louisiana, Surface waters, Toxicity, Testing, Methodology, Test procedures, Evaluation, Alligatorweed, Chemical analysis, Data collections.
Identifiers: *Herbicides (Silvex).

The effects of the herbicide Kuron (silvex) applications to alligatorweed on water quality and fish in surface waters of North Carolina and Louisiana are presented. Three treatments of Kuron (silvex) were applied at a rate of eight pounds acid equivalent per surface acre to alligatorweed at two study areas in North Carolina. Field observations indicated that silvex at the concentration applicable in treating alligatorweed was toxic to certain species of fish at one of the study areas. Laboratory analysis showed accumulations as high as 70 ppm in non-predator fish flesh. Invertebrates contained silvex residues in varying concentrations for more than seven weeks. Water and hydrosoil samples in most cases contained silvex residues for seven months after the last treatment. Three ponds in Louisiana collectively received a total of 13 Kuron treatments using the same application rate as used in North Carolina. Fish mortality occurred in seven of the thirteen treatments. Mortality was observed at all three ponds during the study. Laboratory analysis showed silvex accumulations as high as 19 ppm in non-predator fish and 16 ppm in predator fish. Silvex treatments changed the invertebrate composition. Water and hydrosoil contained silvex residues in varying concentrations. (Woodard-USGS)
W71-06703

SYMPOSIUM ON SEA-LEVEL CANAL BIOENVIRONMENTAL STUDIES.
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W71-06714

ELEMENTAL AND HYDROLOGIC BUDGETS OF THE PANAMANIAN TROPICAL MOIST FOREST,
Georgia Univ., Athens. Inst. of Ecology.
For primary bibliographic entry see Field 02A.
W71-06717

A LABORATORY METHOD FOR THE STUDY OF MARINE BENTHIC DIATOMS,
Oregon State Univ., Corvallis. Dept. of Botany.
C. David McIntire, and Barry L. Wulff.
Limnology and Oceanography, Vol 14, No 5, p 667-678, 1969. 6 fig, 4 tab, 20 ref. NSF Grant GB-7203.

Descriptors: *Laboratory tests, *Laboratory equipment, *Benthic flora, *Light intensity, *Ecosystems, *Model studies, Diatoms, Vertical migration, Distribution patterns, Respiration, Intertidal areas, Acclimatization, Bottom sediments, Tidal effects, Oregon.
Identifiers: *Marine benthic diatoms, *Yaquina Bay (Oregon), *Model ecosystem, Desiccation, Vertical distribution, Substrate, Respirometer.

Effects of light intensity and of exposure to desiccation on the vertical distribution and growth of populations of marine benthic diatoms were investigated in a laboratory model ecosystem and in a respirometer chamber. The diatom flora that developed in the ecosystem was similar to that from field stations in lower Yaquina Bay, Oregon. The vertical distribution of many species was closely related to light intensity and period of exposure to desiccation. Biomass accumulated most rapidly on substrates subjected to high light intensities, without exposure to desiccation. Communities acclimated to different light intensities and periods of desiccation responded differently to changes in light intensity in the respirometer chamber. Results of these experiments indicate that the laboratory apparatus described can be useful in the study of simplified intertidal communities. (Sjolseth-Washington)
W71-06723

FIELD OBSERVATIONS ON THE USE OF SODIUM CYANIDE IN STREAM SURVEYS,
Tennessee Game and Fish Commission.
William R. Tatum.
Presented at the 22nd Annual Meeting of the Southern Division of the American Fisheries Society, Baltimore, Oct 21-23, 1968. Unpublished. 7 p manuscript only. 1 tab, 3 ref.

Descriptors: *Fish populations, *Toxicity, *Evaluation, *Census, Tennessee, Surveys, On-site investigations, Sodium compounds, Fish management, On-site data collections, Crustaceans, Water temperature, Benthos, Benthic fauna, Insects, Mollusks, Annelids, Trout, Rainbow trout.
Identifiers: *Sodium cyanide, *Stream surveys.

Sodium cyanide has been an effective method for sampling the stream fish populations in Eastern Tennessee. Its portability makes it a practical stream management tool. Cyanide is an excellent cold weather sampling method. Three ounces of cyanide in trout streams and six ounces in warmwater streams per cubic foot per second flow will sample 100 yards. In water colder than 55F, mortality of fish is not acute. Rainbow trout and various warmwater fish collected with cyanide and held in aquaria showed no deleterious effects from exposure to the chemical. Reduction in stream invertebrate populations after cyanide application is evident. (Sjolseth-Washington)
W71-06724

CHEMICAL COMPOSITION OF RAINBOW TROUT URINE FOLLOWING ACUTE HYPOXIC STRESS,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
Joseph B. Hunn.
Transactions of the American Fisheries Society, Vol 98, No 1, p 20-22, 1969. 1 tab, 16 ref.

Descriptors: *Stress, *Oxygen requirements, *Urine, *Rainbow trout, *Fish physiology, Sodium, Potassium, Magnesium, Phosphates, Chlorine, Hydrogen ion concentration, Trout, Salmonids.
Identifiers: *Salmo gairdnerii.

Rainbow trout were anesthetized with MS-222, catheterized, and placed in urine collecting chambers. After acclimation and collection of control urine samples, water flow was discontinued for 30 min. Oxygen levels dropped from 4.9 to 2.8 mg/l. Following this stress, water flow was restored and accumulated urine samples were collected at 1, 4 and 20 hours post-stress. Normal urine pH is 7.0, but post-hypoxia it becomes acidic. Abnormally high levels of Na K, Mg, Cl and inorganic PO4 were present in the urine after hypoxic stress. (LeGore-Washington)
W71-06725

CONTROL OF OYSTER DRILLS, EUPLEURA CAUDATA AND UROSALPINX CINEREA, WITH THE CHEMICAL POLYSTREAM,
Bureau of Commercial Fisheries, Milford, Conn. Biological Lab.
Clyde L. MacKenzie, Jr.
Fishery Bulletin, Vol 68, No 2, p 285-297, 1970. 2 fig, 5 tab, 7 ref.

Descriptors: *Chemcontrol, *Pesticide toxicity, *Gastropods, Oysters, Chemicals, Aquiculture, Chlorinated hydrocarbon pesticides, Organic compounds, Predation, Snails.
Identifiers: *Oyster drills, *Polystream, *Polychlorinated benzenes, *Benzene, Control, Eupleura caudata, Urosalpinx cinerea, Chlorinated benzenes, Depuration.

Oyster drills are important predators on commercial oyster beds. Applications of Polystream (Hooker Chem. Corp., mixture of polychlorinated benzenes) killed up to 100% of the drills when currents were of low velocity. Spring treatment appears more effective than later treatment, although surviving drills cease feeding for several months, and populations remained reduced for at least two years. Small Polystream residues were noted in oyster tissues, but these were soon eliminated by depuration. Gastropods other than drills were also killed and many other invertebrates were affected by treatment, although entire populations were not eliminated. Several fish were killed, but the extent of the deleterious effect is unknown. (LeGore-Washington)
W71-06726

LABORATORY EVALUATION OF SOME ORGANOPHOSPHOROUS COMPOUNDS AGAINST THE LARVAE OF AEDES (O.) DETRITUS (HALIDAY), AEDES (O.) CASPIUS (PALLAS) AND CULEX PIPIENS L.
Montpellier Univ. (France).
G. Gras, and J. A. Rioux.
Mosquito News, Vol 29, No 2, p 202-209, June, 1969. 5 fig, 6 tab, 15 ref.

Descriptors: *Laboratory tests, *Organophosphorous pesticides, *Mosquitos, *DDT, *Bioassay, *Toxicity, *Larvacides, *Chlorinated hydrocarbon pesticides, *Metal organic pesticides, *Pest control, *Pesticides, Evaluation, Chemcontrol, Larval growth stage, Lethal limit, Insect control, Pesticide toxicity.
Identifiers: *Aedes caspius, *Aedes detritus, *Culex pipiens pipiens, Parathion, Fenthion, Dorsban, Malathion, Fenitrothion.

LC50 and LC90 values for the fourth instar larvae of three species of mosquito are given for 30 insecticides. Twenty-five are organophosphorous compounds. DDT, carbonyl and three organometallic compounds are included for comparison. Dosage response time and susceptibility level graphs are given for the organophosphorous compounds. (Sjolseth-Washington)
W71-06727

A POTENT CHEMOTHERAPEUTIC AGENT AGAINST FISH DISEASES: 6-HYDROXYMETHYL-2- (2- (5-NITRO-2-FURYL) VINYL) PYRIDINE (P-7138),
Dainippon Pharmaceutical Co., Osaka (Japan).
Masanao Shimizu, and Yoshiyuki Takase.

Bulletin of the Japanese Society of Scientific Fisheries, Vol 33, No 6, p 544-554, 1967. 2 fig, 15 tab, 9 ref.

Descriptors: *Pyridine pesticides, *Fish diseases, *Bactericides, *Fish farming, *Fungicides, *Aquiculture, *Inhibition, Fish management, Chemcontrol, Pathogenic bacteria, Eels, Analytical techniques, Inhibitors, Toxicity, Evaluation, Absorption, Growth rates, Fungi.
Identifiers: *Chemotherapeutic agents, *P-7138, *Aeromonas liquefaciens, Aeromonas salmonicida, Saprolegnia parasitica, Goldfish.

6-Hydroxymethyl-2 (2- (5-nitro-2-furyl) vinyl) pyridine (P-7138) exhibited inhibitory activity in vitro at low concentrations (1 mcg (sic)/ml or less) against most of 30 tested Gram negative and Gram positive bacteria, including several strains isolated from fish. It was also active in vitro against fungi and Trichomonas sp. P-7138 was effective against Aeromonas liquefaciens both when administered orally to fish and when fish were bathed in solution. Only doses on the order of 2000 mg/kg of fish weight were lethal to eels. (Sjolseth-Washington)
W71-06728

OXYGEN POISONING IN THE ANNELID TUBIFEX TUBIFEX. I. RESPONSE TO OXYGEN EXPOSURE,
Illinois Univ., Urbana. Dept. of Physiology.
Joann G. Walker.
The Biological Bulletin, Vol 138, No 2, p 235-244, 1970. 2 fig, 3 tab, 31 ref.

Descriptors: *Tubificids, *Water pollution effects, *Mortality, *Dissolved oxygen, Annelids, Respiration, Animal physiology, Analytical techniques, Laboratory tests, Acclimatization, Environmental effects, Toxicity, Animal behavior, Pressure, Aquatic animals, Aquatic environment, Gases, Worms, Oxygen, Pathology, Nitrogen.
Identifiers: *Tubifex tubifex, *Oxygen poisoning, *Pressure effects, *Hyperbaric oxygen, Adaptation.

Exposure to hyperbaric oxygen caused T. tubifex to become hyperactive. The behavioral response to oxygen pressure became complete only after several hours, when the animals either disintegrated or began to resume normal behavior. Exposure to four atmospheres absolute oxygen pressure for 13-15 hr caused high mortality of T. tubifex. Exposure to four atmospheres of absolute oxygen pressure for 9-12 hr killed approximately half of the treated animals, while exposure for 8 hr or less caused no greater mortality than in unexposed controls. The lethal effects of oxygen exposure developed only after several hours. Exposure to three atmosphere of nitrogen added to one atmosphere of air for as long as 30 hr resulted in no more deaths than in unexposed controls and caused no change in worm behavior. Interruption of a 16 hr oxygen exposure with return to atmospheric conditions enhanced survival of oxygen-treated T. tubifex. Increased duration of interruption led to increased survival of oxygen-treated worms. Adaptation to hyperbaric oxygen occurs in T. tubifex following several weeks of exposure to atmospheric oxygen tensions in shallow containers without a protective mud environment. (Sjolseth-Washington)
W71-06730

THE RELATION BETWEEN TEMPERATURE AND TOXICITY OF PCP FOR THE CARP FISH. STUDIES ON THE BIOLOGICAL ASSAY OF CHEMICALS TO FISH. VI (IN JAPANESE),
Ihara Agricultural Chemicals Inst., Shimizu (Japan).
Shoji Asano, Sumio, Nagasawa and Shizue Fushimi.
Botyu-Kagaku, Vol 34, No 1, p 13-21, 1969. 7 fig, 6 tab, 17 ref. English summary.

Descriptors: *Phenols, *Carp, *Bioassay, *Toxicity, *Water temperatures, Fish physiology, Thermal stress, Water pollution effects, Lethal limit, Regression analysis, Mathematical studies, Isotherms, Fishkill, Statistical methods, Statistical models, Chemical wastes.
Identifiers: *PCP, *Water temperature effects.

Relationships between the lethal action of PCP-Na (sodium pentachlorophenate) salt to carp and temperature are discussed from statistical and physiological points of view. A complete time-mortality curve is presented. The median lethal times in a PCP concentration of 0.8 ppm were determined at 23, 26, 29, 32 and 35 deg C. A linear relationship between the median lethal time and temperature was obtained, and a positive temperature coefficient for PCP lethality was found. PCP's lethality increases approximately two-fold with each 10 deg C rise in temperature. The standard deviation of the carp's susceptibility, however, increases with increasing temperature. The median lethal times at PCP concentrations of 0.5 to 16.0 ppm were also determined at 20, 23, 26, 29 and 32 deg C. The relationship between lethal time, PCP concentration and temperature could be determined with a multiple regression equation. By transforming concentration into temperature, with a factor for equalizing individual differences in lethal concentration, the relationship between temperature and lethal time was derived. A linearity similar to that described above was obtained between these two variables. (LeGore-Washington)
W71-06731

THE LEVEL OF N-AMMONIA AND N-UREA IN THE BLOOD SERUM AND BRAIN OF HEALTHY AND AMMONIA-INTOXICATED CARPS (CYPRINUS CARPIO L) (IN CZECH),
Vyzkumny Ustav Rybarsky a Hydrobiologicky Vodnany, Prague (Czechoslovakia).
Z. Svobodova.
Bulletin VUR Vodnany, Vol 6, No 1, p 11-19, 1970. 2 fig, 9 tab, 21 ref. English summary.

Descriptors: *Ammonia, *Carp, *Nitrogen compounds, *Fish physiology, Water temperature, Toxicity, Toxins, *Ureas.
Identifiers: *Cyprinus carpio, Blood serum, Detoxification, Brain.

The physiological values were determined of N-ammonia and N-urea in the blood serum of carp in two periods (Sept. - Oct. and Nov. - Dec.). Higher values were obtained in September and October, and may be explained by a more rapid metabolism of nitrogenous substances, connected with a higher water temperature. An acute intoxication of carp results in an increase in blood serum N-ammonia levels (five times); a chronic intoxication causes an approximate five-fold increase as compared with physiological values in each case. The methods of ammonia detoxification of carp is discussed. The level of N-ammonia in the brain of the fish after an experimental acute intoxication with ammonia is more than three times that of healthy fish. The use of these results for diagnostic purposes will be subject to further study. Changes in the levels of N-ammonia in the blood serum and brain of carp during acute intoxication with ammonia were examined. The most pronounced rise of the level of N-ammonia occurs during the first five minutes. The level increases only slowly thereafter. (LeGore-Washington)
W71-06732

ABSORPTION OF ENDRIN BY THE BLUEGILL SUNFISH, LEPOMIS MACROCHIRUS,
Louisiana State Univ., Baton Rouge. Industrial Research Lab.
Harry J. Bennett, and John W. Day, Jr.
Pesticides Monitoring Journal, Vol 3, No 4, p 201-203, 1970. 1 fig, 16 ref. NIH Grant ES-00276-01.

Descriptors: *Pesticides toxicity, *Organophosphorous pesticides, *Endrin, *Sunfishes, *Toxicity, Pesticides, Lethal limit, Absorption, Toxins, Agricultural chemicals, Fish, Fish physiology, Fish toxins.
Identifiers: *Bluegill, *Lepomis macrochirus, TLm, Gastrointestinal tract, Liver, Muscle.

Endrin absorbed by bluegill sunfish in lethal and sublethal concentrations was determined by electron capture gas chromatography. The amount of absorption was measured for the entire body, skeletal muscle, liver and gastrointestinal tract over 24 hr. At the lethal level (2.0 ppb), all the tissues absorbed increasing amounts of endrin throughout the tests. At the sublethal level (0.2 ppb), the entire body, skeletal muscle and liver exhibited an N-shaped absorption curve, with an initial sharp rise in endrin levels, followed by a drop, with a subsequent rise. This implies development of a temporarily effective mechanism for coping with the endrin. At the 0.2 ppb level, the gastrointestinal tract absorbed increasing amounts of endrin throughout the tests. (LeGore-Washington)
W71-06733

A KINETIC MODEL OF FISH TOXICITY THRESHOLD,
California Univ., Berkeley. Dept. of Civil Engineering.
Carl W. Chen, and Robert E. Selleck.
Journal of the Water Pollution Control Federation, p 294-308, August, 1969, part 2. 9 fig, 6 tab, 14 ref.

Descriptors: *Mathematical models, *Model studies, *Bioassay, Toxicity, Fishkill, Potassium compounds, Water pollution effects, Laboratory tests.
Identifiers: *Kinetic model, *Toxicity threshold, *Threshold concentrations, *Mixtures, *Dilution ratio, Zinc, Cyanide, Antagonism, Synergism.

A procedure is presented which may be used to determine the threshold concentrations of various mixtures of toxicants as well as to evaluate the proportional amounts of toxicity furnished by the individual toxic components, taking into account possible synergistic or antagonistic effects. For experimental verification of the model, zinc and cyanide were selected as toxicants. The survival function describing the fish bioassay data was found to be exponential after an initial induction period. The exponential rate coefficient is a function of at least four other coefficients when the toxicant concentration is maintained constant. The threshold concentrations of zinc and cyanide under the specified experimental conditions are 0.33 and 0.236 mg/l, respectively. (Sjolseth-Washington)
W71-06734

RELATIONS BETWEEN THE STRUCTURE OF CHLORAMPHENICOL AND ITS VEGETALIZING EFFECTS ON SEA URCHIN, PARACENTROTUS LIVIDUS, EGGS (IN FRENCH),
Station Zoologique, Villefranche-sur-Mer (France).
R. Lallier.
Acta Embryologiae et Morphologiae Experimentalis, Vol 10, p 280-287, 1968. 1 fig, 25 ref. English abstract.

Descriptors: *Physiological ecology, *Biochemistry, Inhibition, Chemical reactions, Embryonic growth stage, Mode of action, Chemicals, Proteins, Synthesis, Aquatic animals, Aquatic environment, Pollutants, Bioassay, Nitrogen compounds, Eggs, Invertebrates.
Identifiers: *Chloramphenicol, *Sea urchin eggs, *D-threo-chloramphenicol, *Chemical structure, *Nitrobenzene, *Alanine, Benzene, Developmental inhibition, Sterioisomers, Protein synthesis.

The effects of various analogues of chloramphenicol on the differentiation of sea urchin eggs were studied and compared to the vegetalizing effects of D-threo-chloramphenicol. Its sterioisomer, L-threo-chloramphenicol, inhibited development, but no vegetalizing effect was observed. The substitution of the nitro group in the D-isomer by an aminosulphonyl (sic) group (D-AMP-3) or by a methylsulphonyl group (D-thiophenicol) suppressed the vegetalizing action, and also inhibited development. With the substitu-

tion by a thiomethyl group (D-Win 5094), the vegetalizing activity was greatly reduced. Various nitrobenzene derivatives (p-nitrophenol, p-nitrobenzoic acid, p-nitrophenylhydrazine) inhibited development. L-beta- (nitrophenyl)-alpha-alanine reversibly stopped development at the blastula stage. Nitrobenzene and nitroaniline exerted some weak vegetalizing effect, indicated by a low percentage of gastrulas strongly pigmented with small evaginated entodermic vesicles. The nitro group appears to be important for the vegetalizing activity of chloramphenicol. The differential action of D-chloramphenicol on protein synthesis is suggested to explain its vegetalizing effects. (LeGore-Washington)
W71-06735

EFFICACY OF DI-N-BUTYL TIN OXIDE ON AN INTESTINAL FLUKE, CREPIDOSTOMUM FARIONIS, IN GOLDEN TROUT,
Wyoming Game and Fish Research Lab., Laramie.
Douglas L. Mitchum, and Tom D. Moore.
The Progressive Fish Culturist, Vol 31, No 3, p 143-148, July 1969. 2 tab, 3 ref. Dingell-Johnson Project, FW-3-R, Wyoming.

Descriptors: *ChemControl, *Parasitism, *Evaluation, *Fish parasites, *Fish kill, Fish management, Fish hatcheries, Fish diseases, Infection, Bioassay, Toxicity, Laboratory tests, Residues, Animal pathology, Public health, Rainbow trout, Mortality, Trout, Rainbow trout, Antihelminthes (Pesticides).
Identifiers: *Crepidostomum farionis, *Di-n-butyl tin oxide, Golden trout, Intestinal flukes, Flukes.

An experiment was conducted to determine whether di-n-butyl tin oxide has anthelmintic properties against Crepidostomum farionis in golden trout. Toxicity experiments were conducted on both rainbow and golden trout. Doses fed to the fish over a three day period were 150, 250 and 350 mg/kg of body weight. Fish were killed periodically after the three day treatment period and examined for flukes. Doses of 150, 250 and 350 mg/kg were 100% effective in eliminating the flukes. Intestinal, digestive tract, internal organs and muscle tissues were assayed for tin. Tin residues were found only in the digestive tract, primarily in the intestine. The data indicate that the tin compound is not readily absorbed by tissues outside the digestive tract and that the compound is rapidly eliminated by trout. (Sjolseth - Washington)
W71-06736

CHANGES IN FISH POPULATIONS AND MIGRATION IN RELATION TO INCREASED SEWAGE POLLUTION IN LITTLE PATUXENT RIVER, MARYLAND,
Maryland Univ., Solomons. Natural Resources Inst.
Chu-Fa Tsai.
Chesapeake Science, Vol 11, No 1, p 34-41, 1970. 3 fig, 3 tab, 13 ref.

Descriptors: *Water pollution effects, *Fish populations, *Fish migration, *Sewage effluents, Fishkill, Fish barriers, Catfishes, White perch, Suckers, Bottom sediments, Dissolved solids, Chlorination, Biological communities, On-site data collections, On-site investigations, Water analysis, Biochemical oxygen demand, Water temperature, Dissolved oxygen, Community development, Maryland, Sunfishes.
Identifiers: *Little Patuxent River (Maryland), *Yearly variations, *Species changes, *Population changes, Smallmouth bass, Black crappie.

Increased sewage pollution in the Little Patuxent River, Maryland from 1958 to 1967 brought about changes in fish migration, abundance of resident species, and the fish community of the stream. The up-stream migration of white catfish, white perch, white sucker, and northern redhorse was apparently adversely affected by the increased sewage pollution. The downstream ranges and abundance of resident smallmouth bass and northern hog sucker decreased as did the upstream ranges and abundance of black crappie. Brown bullhead, golden shiner, redbreast sunfish, and bluegill showed different degrees of changes in abundance without reduction in their distribution ranges. Number of species and fish abundance decreased drastically in the area immediately below the chlorinated sewage outfalls. Downstream, in the organically enriched areas, the fish community composition changed although there were no changes in number of species. (Sjolseth - Washington)
W71-06738

EFFECTS OF THE HERBICIDE SILVEX ON BENTHOS OF A FARM POND,
Missouri Univ., Columbia. Dept. of Zoology.
George L. Harp, and Robert S. Campbell.
The Journal of Wildlife Management, Vol 28, No 2, p 308-317, 1964. 1 fig, 3 tab, 21 ref.

Descriptors: *Benthic fauna, *Animal populations, *Aquatic productivity, *Comparative productivity, *Herbicides, Chrysophyta, Farm ponds, On-site investigations, Water pollution effects, Aquatic plants, Pond weeds, Chemcontrol, Gastropods, Oligochaetes, Aquatic insects, Invertebrates.
Identifiers: *Silvex, *Chaoborus, Typha angustifolia, Potamogeton americanus, Jussiaea, Sagittaria, Leeches.

The bottom fauna of plastic enclosures within a farm pond was investigated before and after treatment with the potassium salt of 2- (2,4,5-trichlorophenoxy) proprionic acid (silvex). Petersen dredge collections were made at 28 day intervals, June, 1961 through August, 1962. Six polyethylene enclosures, 12 x 18 ft, were treated with silvex: three at 2.8 ppm and three at 4.6 ppm. One enclosure and the open pond served as controls. The standing crop of benthos doubled numerically and gravimetrically in enclosures treated with heavy concentrations. The increase in numbers of tendipedids and oligochaetes in the treated areas was correlated with increased organic detritus afforded by decomposing rooted aquatic plants. Chaoborus increased greatly in treated enclosures. Libellulids increased one year after treatment. Snails, leeches and coenagrionids appeared to be unaffected by treatment with silvex in the concentrations used. Chrysops decreased quickly in treated areas and reappeared only during the last two months of the study, and only in enclosures treated with the lighter concentrations. The composition of the benthic community of a farm pond and the control of rooted aquatic plants by silvex are described. (Sjolseth - Washington)
W71-06739

THE COMPATIBLE EXISTENCE OF NON TARGET SPECIES TO PESTICIDES,
Mississippi State Univ., State College. Dept. of Zoology.
Denzel E. Ferguson.
Bulletin of the Entomological Society of America, Vol 15, No 4, p 363-366, Dec, 1969. 35 ref.

Descriptors: *Resistance, *Pesticide toxicity, Water pollution effects, Biological properties, Compatibility, Animal behavior, Animal physiology.
Identifiers: *Ecological adaptations, *Behavior adaptations, *Physiological adaptations, Adaptations, Protective mechanisms, Avoidance, Susceptibility.

Three types of adaptation are discussed by which non-target animals may be adapted for survival in a pesticide-contaminated environment. (1) Ecological adaptations such as habitat selection may determine the extent to which an animal is exposed to pesticides. The niche in the food web may govern the amount of pesticide residue accumulated by a species. (2) Behavioral adaptations such as migration and food preference affect pesticide intake. (3) Physiological adaptations such as natural resistance, penetrative power of insecticides and genetic resistance are known to protect some organisms from toxic effects. Although non-target animals often exhibit numerous mechanisms tha protect them against pesticides, most of thes mechanisms are of limited value in highly con taminated environments. Also, almost all of thes mechanisms involve a dilemma in that one specie is benefitted at the expense of another. The need t develop more specific control measures and les persistant chemicals is stressed. (Sjolseth Washington)
W71-06741

INFLUENCE OF PESTICIDE RUN-OFF I MONTEREY BAY,
Naval Postgraduate School, Monterey, Calif. Dep of Oceanography.
E. C. Haderlie.
Marine Pollution Bulletin, Vol 1 (NS), No 3, p 42 43, March 1970.

Descriptors: *DDT, *Pesticide drift, *Pesticid residues, *Water pollution, *Pesticide toxicity *Surface runoff, *On-site investigations, Pesticid kinetics, Water pollution effects, Aquatic bird Gas chromatography, Gulls, Crabs, Bottom sed ments, Benthic fauna, Estuarine environment, Se lions, Salinas River, Tissue analysis, California Heavy metals.
Identifiers: *DDT, *Monterey Bay (California Bird kill, Cormorants, Grebes, Petrels.

Evidence exists suggesting that runoff from DD treated farmlands in the Salinas River Valley California has resulted in pesticide (DDE) con tamination of the benthic community and the bo tom sediments of Monterey Bay. The Salinas Rive is the only major tributary entering the bay. A bir kill occurred in Monterey Bay in 1969 after exte sive surface runoff from the Salinas Valley. Th dead seabirds contained DDE levels as high higher than anywhere in the area: 805 ppm DDE the liver of a gull, 412 ppm DDE in the liver of petrel, and 192-292 ppm DDE in livers of weste grebes. A survey being conducted on the benth community and on the bottom sediments of Mo terey Bay is described. It is hoped that this will yie a better understanding of the benthic community Monterey Bay and of the role played in ecologic cycles by heavy metals and by pesticides. (Katz Washington)
W71-06742

EFFECT OF WATER QUALITY IN BE LINGHAM BAY ON JUVENILE SALMON,
Washington Univ., Seattle. Coll. of Fisheries.
D. E. Sjolseth, E. O. Salo, and M. Katz.
Preprint, Fifth International Water Pollutio Research Conference, San Francisco, 1970. Pap I-26, 27 p, 3 fig, 10 tab, 28 ref.

Descriptors: *Water pollution effects, *Pu wastes, *Distribution, *Dissolved oxygen, *Fis populations, *Streamflow, On-site data collection On-site investigations, Chinook salmon, Wat quality, Washington, Fish behavior, Distributio patterns, Tidal effects, Fish management, Fis migration, Marking techniques, Salinity, Wat temperature, Turbidity, Mortality, Regression ana ysis.
Identifiers: *Spent sulfite liquor, *Fish catch, Co salmon, Bellingham Bay Washington, Nooksac River Washington, Townetting.

A two-phase investigation into some ecological fa tors in the estuarine and freshwater nursery are that may affect salmon and may influence t behavior of juvenile salmon was conducted on t Bellingham Bay-Nooksack River system Washington State. No significant correlation w found between dissolved oxygen and spent sulfi liquor. No D.O. levels below 6.6 mg/l and S.S.L.'s above 483 ppm were found. S.S.L. a D.O. were found to have no significant correlatio with the catch of salmon. Two salmon streams we studied during the summer to determine coho sa mon mortality. In both streams there was over 50 mortality during a six-week period in late summe It is the freshwater and not the estuarine habit

which is limiting salmon production. (Sjolseth - Washington)
W71-06743

LIGNOSULPHONATES IN LAKE PAIJANNE WATER,
Helsinki City Waterworks (Finland). Construction Dept.
For primary bibliographic entry see Field 05B.
W71-07027

THE INFLUENCE OF DECOMPOSING SALMON ON WATER CHEMISTRY,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 05B.
W71-07057

5D. Waste Treatment Processes

SEPARATE AND COMBINED SEWERS.

Water Wastes Eng, Vol 5, No 12, p 22, Dec 1968.

Descriptors: *Sewerage, Structural design, Systems analysis, Separation techniques.
Identifiers: *Combined sewers, Sewer hydraulics.

This round table discussion describes the general picture of the storm and sanitary sewerage systems, including the ranges and sizes of each of the types of sewers, of the cities the participants represent. Each participant also relates his city's problems in regard to the effect of combined sewers on treatment plants and under conditions of storm flow. Three of the cities have implemented separate sewers, while three others have not undergone separation because of its high cost. Our city has proposed a less costly plan of eliminating ground water seepage into sewers, and the last city (the only one located in Canada) has not yet estimated the cost of separation.
W71-06523

SEPARATE AND COMBINED SEWERS.

Water Wastes Eng, Vol 5, No 7, p 26, July 1968.

Descriptors: *Sewers, *Methodology, *Separation techniques, Surveys, Comparative costs.
Identifiers: *Combined sewers, Sewer-in-sewers.

Replies by six spokesman from various regions of the United States are given in relation to the following areas of questioning: (1) mile of sewers in the areas investigated; (2) ranges of sizes of each of the sewer types; (3) population serviced by the system; (4) effect of combined sewers on treatment plant operations; (5) surcharging; and (6) plans on sewer separation and costs.
W71-06524

REPORT ON PRESSURE SEWERAGE SYSTEM, SUMMER STREET SEPARATION STUDY AREA, BOSTON, MASSACHUSETTS.
American Society of Civil Engineers, New York; and Camp, Dresser and McKee, Boston, Mass.

Combined Sewer Separation Project, Report, Sept, 1968, FWPCA Program No 11020 EKO.

Descriptors: *Cost analysis, *Design, Pressure conduits.
Identifiers: *Building plumbing separation, *Sewer separation, Boston, Massachusetts, Gravity sewer, Sewage flow variations.

The report studies the design, estimated costs, and evaluates the feasibility of the hypothetical application of the ASCE Project Scheme of pressure sewers for separation in representative combined sewer areas from layouts by the Project staff. The Boston study researched the 53-acre gently sloping, heterogeneous commercial Summer Street Separation Study Area. The report describes the separation of building plumbing in detail in a typical three-quarter century old five story and basement commercial building 65-ft. by 145-ft. in plan, and estimates the cost of plumbing separation. Four alternative pressure sewer collection systems are indicated with plans and hydraulic profiles. Some systems included in-line main pumping stations. The least expensive complete pressure system, which did not include a main pumping station, is estimated to cost $4,700,000. Both costs include costs of building plumbing separation, $4,000,000 for the pressure system including communitors, wet walls and non-clog pumps, and 2,000,000 for the gravity systems.
W71-06525

SEPARATION OF COMBINED WASTE WATER AND STORM DRAINAGE SYSTEMS, SAN FRANCISCO STUDY AREA.
Brown and Caldwell, San Francisco, Calif.

ASCE Combined Sewer Separation Project Report, FWPCA Program No 11020 EKO.

Descriptors: *Cost analysis, *Design, Pressure conduits.
Identifiers: *Building plumbing separation, *Sewer separation, Gravity sewer, Plumbing code, San Francisco (Calif), Storage-grinder pump.

The report studies the design, estimated costs, and evaluates the feasibility of the hypothetical application of the ASCE Project Scheme of pressure sewers for separation in representative combined sewer areas from layouts by the Project staff. The San Francisco study researched the 323 acre predominantly residential, steeply sloping, Launa Street Sewer Service District. The report describes methods of building plumbing separation and indicates two alternative arrangements of pressure sewers, with plans and profiles. Estimates of construction cost of each are compared with that of a conventional gravity system of separation designed earlier by the City. Plumbing separation, is estimated to cost about $5,400,000 for the gravity method and about $4,400,000 for the pressure method not including storage-grinder-pump units.
W71-06527

WATER-POLLUTION ABATEMENT,
F. C. Diluzio.
Am City, Vol 82, No 12, p 21 and 29, Dec 1967.

Descriptors: *Sewers, Pollution abatement.
Identifiers: Holding tanks, Treatment processes, Combined sewers.

The FWPCA is searching for more effective and less expensive means than physical sewer separation to solve combined-sewer problems. A combination of holding tanks and treatment processes is one method being tested; other alternatives are being examined.
W71-06528

COMBINED SYSTEM--SEPARATE SYSTEM,
W. V. D. Emde.
Oesterr Wasserwirtsch (OSWAAI), Vol 19, No 7/8, p 125-130, 1967.

Descriptors: *Investigations, *Sewers, *Sewerage, Hydrograph analysis, Design.
Identifiers: *Combined sewers, *Separate system.

In a paper presented at a seminar on canalization held at Raach, Austria, in 1967, the author gave details of investigations into the efficiency of sewerage systems, and outlined the advantages and disadvantages of separate systems as compared with combined systems. Describing the design and construction of each system he emphasized that neither could be regarded as the more efficient, and stressed the need for graphical and hydrographical surveys when sewerage systems are planned and that the final decision must depend on the purposes which the sewerage system is to serve. For small communities, housing estates, and small hotels the combined system can be of advantage, provided the discharge of rainfall and runoff is controlled and the quality of the receiving waters is not affected. Where future plans require extensions of sewerage systems, the separate system is more suitable, as long as operational control and plant maintenance are carried out regularly.
W71-06529

STORM-WATER TANKS IN COMBINED SEWERAGE SYSTEMS,
D. Londong.
Ber Abwassertech Ver (BABVAD), Vol 19, p 195-210, 1968.

Descriptors: *Design, *Application methods, *Flow control.
Identifiers: *Storm tank, Combined sewers.

The author discusses the important role of stormwater tanks used to prevent and retard the discharge of sudden and heavy rainfalls from combined sewerage system to receiving waters, and he gives details of design calculations for these tanks and their application.
W71-06530

STORM-WATER TANKS IN COMBINED SEWERAGE SYSTEMS,
D. Londong.
Staedtehyg (STDHAT), Vol 17, No 9, p 199-206, 1966.

Descriptors: *Flow control, *Analysis, *Pollution abatement, *Rainfall disposition, Flow rates.
Identifiers: *Storm tank, Germany.

Rainwater, discharged from combined or separate systems, can have severe polluting effects on receiving waters especially in industrial areas. Discussing the methods used for reducing such pollution, the author refers to German specifications for three standard types of stormwater retarding tanks, designed to prevent the direct discharge of the first flush of rainfall and to restrict the flow from being carried forward to receiving waters or sewage works. Various methods of calculations for stormwater retarding tanks in sewerage systems are reviewed and compared as to their accuracy. Illustrated details are given of a revised method in which different rates of flow at varying durations of rainfall can be calculated using different parameters.
W71-06532

MALLING RDC REGIONAL DRAINAGE SCHEME,
D. Lowe.
Surveyor, Vol 82, No 3971, p 29-33, Jul 12, 1968. 5 fig, 1 tab.

Descriptors: *Sewage treatment, *Sewers, *Treatment facilities, *Sewage disposal, *Design, *Construction.
Identifiers: *Combined sewers, *Great Britain, Trunk sewer.

Owing to restrictions on the choice of available sites, unusual design and construction techniques were required to build a sewage treatment works which forms part of the 3 million pounds-sterling Snodland-Ightham regional drainage scheme in a rural district of Kent. The Snodland area was mostly sewered on a partially combined system to a totally inadequate sewage disposal works, and the Ditton area's disposal works was heavily overloaded. The basis of the new sewerage system is a trunk sewer laid from a new sewage disposal works. Into this main trunk system flow from area villages will be brought by either pumping or gravity. Solutions to each town's problems will be implemented through the use of intercepting sewers, pumping stations, pumping mains, etc. Aspects concerning site selection for the new sewage works are

discussed, and then the design of the works is detailed. Construction problems and solutions to these problems are explained in regard to both the regional sewerage scheme and the sewage disposal works.
W71-06533

WASTE WATER SYSTEM FOR THE METROPOLITAN CORPORATION OF GREATER WINNIPEG,
A. Penman.
J Water Pollution Control Fed, Vol 39, No 3, p 373-383, Mar 1967.

Descriptors: *River regulation, *Sewerage, Future planning (Projected), Recreation, Urbanization.
Identifiers: *Separate system, *Investigations.

The Metropolitan Corporation recognized its duties in restoring the rivers to the requirements of the urban area so that the citizens could use these rivers for recreational purposes. This necessitated the expansion of the existing facilities and the addition of new facilities. Sewer rentals and industrial wastes were two major areas investigated. A separate sewer system was looked into by both city and consulting engineers. It was decided that the $200 million plus cost of intercepting the old combined system was not feasible; however, future development of areas along the Red and Assiniboine Rivers will be based on separate sewer systems.
W71-06534

PROBLEMS OF COMBINED SEWER FACILITIES AND OVERFLOWS,
R. H. Sullivan.
J Water Pollution Control Fed, Vol 41, No 1, p 113-121, Jan 1969.

Descriptors: *Surveys, *Effects.
Identifiers: *Combined sewers.

The author summarizes and discusses some of the principal points found during a survey, carried out by the Federal Water Pollution Control Administration, on the problems caused by combined sewers.
W71-06535

OPERATION OF SEWERAGE WORKS FOR BUDAPEST,
M. Szilagyi.
Paper presented at a conference on the Construction of Complex Supply Installations at Budapest, 1968, Theme No 4.4.

Descriptors: *Sewerage, *Sewers, *Surveys.
Identifiers: *Hungary.

The built-up area of Budapest covers 23,700 ha, of which 9400 ha are connected to the sewerage system. In 1966 the length of the sewer network has about 2000 km. There were 32 sewage works and pumping stations, and the quantity of sewage and rainwater discharge amounted to over 300 million m cu. The annual volume of sludge removed from the sewer amounted to 60,000 m cu.
W71-06536

COMBINED SEWERS MAY BE AN ADVANTAGE,
Frank I. Vilen.
Am City, Vol 85, No 1, p 68-70, Jan 1970.

Descriptors: *Sewers, *Design, Storm runoff, Biological treatment, Separation techniques.
Identifiers: *Kenosha, Wisconsin, *Combined sewers, Sludge treatment plants.

An alternative to separation, which utilizes combined sewers in conjunction with activated sludge treatment plants, is being put into operation in Kenosha, Wisconsin through a FWPCA grant. The plant employs the biological-adsorption process and can treat up to 20 mgd of combined sewage. Details of how the system works are included as well as a flow sheet diagram of the plant. The plant will save the city at least $6 million over sewer separation and during dry weather portions of the system can supplement normal plant operations. The plant will treat flow from only 70-80% of the storms, but because of the 'first flush' action of storm runoff, the greatest bulk of BOD and suspended solids will be captured. Parameters to be measured and evaluated to determine the efficiency of the system are listed.
W71-06537

COMBINED SEWERS IN CANADA,
D. H. Waller.
Eng J, Vol 52, No 6, p 22-30, Jun 1969, Paper presented at the Annual General Meeting of the Engineering Institute of Canada, May 29-31, 1968.

Descriptors: *Sewers, *Surveys, Overflow, Separation techniques.
Identifiers: *Combined sewers, *Canada.

The author presents a survey of combined sewers in Canada similar to the one he undertook in 1967 on the same subject in the United States. Even when combined sewers are large enough to carry peak storm flows in addition to domestic sewage, they do not provide the higher velocities in dry weather that are needed to prevent solid deposition. Thus, up to 1/3 the annual production of solids and BOD may be overflowed during storms and held back from treatment. Problems such as these necessitated this study which provides information in four main areas: (1) the extent and distribution of Canada's combined sewers; (2) the prevailing attitudes and policies in regard to combined sewers; (3) factors influencing these attitudes and policies; and (4) descriptions of methods proposed and adopted to diminish overflows from combined sewers. A majority of the population surveyed considered combined sewer overflows to be a nuisance. Separation is too expensive to warrant institution in most communities. Some combined systems have not yet developed to the point where they include overflow, and in some areas the pollution from this source is not considered to be a problem. More information is needed regarding less-costly alternatives to separation. Separation should be implemented without delay for flood relief, when combined sewers are replaced and in new construction, or in plumbing for new buildings. These programs are not overly expensive, and they leave open the option of instituting alternatives which future technology may uncover.
W71-06538

AVONMOUTH INDUSTRIAL ESTATE--UNUSUAL DRAINAGE SCHEME,
K. J. West.
J Inst Munic Engrs, Vol 95, No 12, p 363-367, Dec 1968.

Descriptors: *Drainage systems, *City planning, Urbanization, Sewerage, Separation techniques.
Identifiers: *Great Britain, *Combined sewers.

Systems of drainage considered for the City of Bristol, England include: a separate system with stormwater draining to rhines; a separate system with stormwater draining through pipes to existing outfall culverts; and, combined systems. The combined sewerage system was adopted for a major part of the estate.
W71-06539

STOKE SEWER RENEWED AFTER CRUDE SEWAGE OVERFLOW.
Surveyor, Vol 85, No 4049, p 38-39, Jan 16, 1970. 1 fig.

Descriptors: *Sewerage, *Sewers, *Treatment facilities, *Control structures, Control systems, Contracts, Construction.
Identifiers: *Great Britain.

A sewerage reconstruction program in the Burslem area of Stoke-on-Trent involves a four-stage renewal of the sewer system and reconstruction of the water pollution control works. Old sewers were in poor structural and hydraulic condition, and several sections of the main outfall sewer upstream of the treatment works collapsed causing crude sewage to overflow and form a large lake of sewage. Two contracts provided a sanitary sewer from the works plus a surface water culvert connecting with a feeder to the River Trent. A third contract provided a separate storm and sanitary system connecting the old sewer network with the sewer and culvert constructed previously. Other structures built under the contract are described.
W71-06540

OUTLINE DESCRIPTION OF ASCE PROJECT ON 'SEPARATION OF SANITARY SEWAGE FROM COMBINED SYSTEMS OF SEWERAGE'.
American Society of Civil Engineers, New York.

ASCE Combined Sewer Separation Project Technical Memorandum No 1, Feb 21, 1966. FWPCA Program No 11020 EKO.

Descriptors: *Pressure conduits, Separation techniques.
Identifiers: *Combined sewers, *Sanitary sewage, Comminuted sewage.

Descriptions of the project separation scheme, project goal and project background are given. The general concept of the ASCE Project scheme is to pump cumminuted sanitary sewage from individual buildings and building complexes through relatively small pressure tubing laid in existing building connections and thence into new pressure conduit suspended in existing street sewers. Potential advantages of the scheme are discussed. The project wishes to develop feasible designs and operation and to test them in actual systems. The immediate objective is to examine and evaluate both the feasibility and probable cost. The background of the project is reviewed. An appendix summarizes the need for separation of combined sewerage systems and the national scope of the problem.
W71-06541

MASSIVE SEWER INFILTRATION,
Thomas E. Llewellyn.
Am City, Vol 83, No 10, p 90-91, Oct 1968.

Descriptors: *Maintenance, *Repairing, Infiltration.

The North Tahoe Public Utility District instituted a massive sewer repair program after it discovered that sewage flows were highly excessive. Snow Creek and Lake Tahoe were becoming polluted. 200 manholes were leaking and permitting entrance of surface and groundwater, and many lateral sewers were causing infiltration. Smoke bombs employed to pinpoint offenders disclosed storm inlets connected to sanitary sewers. Methods used to correct violations and sewer defects are described.
W71-06542

SUBURB MEETS URBANIZATION HEAD-ON.
Water Wastes Eng, Vol 4, No 11, p 47-49, Nov 1967.

Descriptors: *Sewerage, *Design, Costs, Michigan
Identifiers: *Storm sewers, Expenditures.

The city of East Lansing, Meridian Township Board, and Michigan State University jointly agreed to provide a municipal sewer system for the fast-growing college and recreational area in Ingham County, Michigan. The original septic tanks were connected to storm sewer system which led to a newly constructed sewage treatment plant. Financial problems and an itemized list of expenses are discussed.
W71-06551

POLLUTION ABATEMENT THROUGH SEWER SYSTEM CONTROL,
W. T. Eiffert and P. J. Fleming.
Journal Water Pollution Control Federation, Vol 41, No 2, p 285-291, Feb 1969.

Descriptors: *Waste water treatment, *Pollution abatement, Sewers, Sewerage.
Identifiers: *Storm sewer pollution, *Dayton, Ohio.

Concurrent with a major waste water treatment plant expansion program in Dayton, Ohio, for effluent release into the Great Miami River, a four point program has been initiated to eliminate pollution from storm sewers. Although Dayton has a separate sewer system, untreated industrial plant wastes and municipal by-passes must be eliminated to insure the 90 to 95 percent pollution reduction required by water quality standards.
W71-06557

DUNFERMLINE PAST, PRESENT AND FUTURE,
For primary bibliographic entry see Field 05G.
W71-06562

OHIO STORMS BURST TWO RESERVOIRS.
For primary bibliographic entry see Field 05G.
W71-06563

LEAST COST SAND FILTER DESIGN FOR IRON REMOVAL,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
Jerry Y. C. Huang, and E. Robert Baumann.
Journal of the Sanitary Engineering Division, ASCE, Vol 97, No SA 2, p 171-190, April 1971. 20 p, 5 fig, 9 tab, 7 ref, 1 append.

Descriptors: *Optimization, *Mathematical models, *Design, *Computer programs, Operating costs, Flow rates, Head loss, Sewage treatment.
Identifiers: *Least cost analysis, *Sand filtration, Iron removal.

An empirical filter performance prediction model was used in developing a computer program for predicting sets of equivalent sand filter designs and their first and operating costs. It was confined to a consideration of studies of the optimization of influent control, single-media sand filters to remove iron from suspension in water. The effects on the cost of the filter system of pertinent variables such as sand size, sand depth, terminal head available, flow rate, and run length were evaluated. Of the variables affecting filtration performance, the two held constant were: (1) kind of influent suspended solids; and (2) method of filter operation. The performance prediction model assumed that the flow rate remained constant during a filter run. For all sand sizes studied (0.6 mm to 1.3 mm), the optimum design filtration rate (4.0 gpm per sq. ft. - 5.5 gpm per sq. ft.), run length (32 hr. - 42 hr.), and terminal head loss (8 ft. - 11 ft.) all closely approximated values used in current practice. The optimization techniques developed to predict both the filter designs providing equivalent performance and their costs have potential application in design of new filtration plants and prediction of operating conditions, such as run length and effluent quality, of existing sand filtration plants. (Kriss-Cornell)
W71-06585

THE TIDAL THAMES 1967.
Effluent Water Treat J, Vol 8, No 9, p 463-465, Sep 1968.

Descriptors: *Pollution abatement, *Design, Sewerage, Estuaries, Storm runoff.
Identifiers: Thames River, Storm sewage, Great Britain.

The article concerns aspects of pollution control along the tidal river. The greatest effect of the discharge from the Greater London Council sewage works on the tidal Thames originated from the outfall works at Beckton. A scheme for reduction in storm sewage discharges from the sewerage system leading to the Beckton works was being examined. New trunk sewers, a pumping plant, and storm sewage tanks would be most likely involved in the scheme. The cost of the Beckton improvements was estimated at 21 million pounds, and of the improvements of the sewerage and storm sewage disposal systems at 22 million pounds.
W71-06629

WHAT TO DO WITH SEWAGE WHEN IT RAINS HARD.

Eng News-Record, Vol 178, No 16, p 30-31, Apr 20, 1967.

Descriptors: *Tunnel construction, *Tunnels, Storm runoff, Water treatment, Control systems.
Identifiers: *Chicago.

Chicago is building a $14.4-million deep tunnel system to carry spillages from combined storm and sanitary sewers during rainfall. The FWPCA has indicated four main areas related to stormwater runoff problems which require further study and demonstration: drainage area control; collection system control; external discharge control, including treatment of both combined sewer overflow and stormwater run-off; and a miscellaneous area, consisting of the economic feasibility of substituting separate sewers for combined sewers and local for central treatment facilities, better hydrologic analyses, new management procedures, construction materials and methods, and the development of performance criteria for standards of water quality.
W71-06631

WATER MONEY NEEDS REQUIRE MORE THAN PROMISES.

Environ Sci Technol, Vol 4, No 4, p 278, Apr 1970.

Descriptors: *Pollution abatement, Water treatment.
Identifiers: Waste treatment costs, Sewered population statistics.

S. 3472, the program for water pollution cleanup, calls for $10 billion for construction of municipal waste treatment plants. Among spokesmen at the 4th Annual Legislative Seminar concerned with the continuing cleanup is James R. Ellis who states that cities are in a catch-up situation. According to Ellis, 35% of the sewered population in the United States received 5% of the federal dollar during the period 1965 - 1969. Some of Ellis' suggestions are cited. John L. Salisbury, a Maine spokesman, contends that the need for secondary treatment is being challenged.
W71-06632

ENVIRONMENTAL RESEARCH IN S.E. ASIA.

Water Waste Treatment, Vol 12, No 12, p 392-396, Mar/Apr 1970.

Descriptors: *Storm runoff, *Sewage treatment, *Water pollution, *Foreign research.
Identifiers: *Thailand.

The Thailand government's decision to plan for drainage and sewerage in Bangkok has led to increased research at the Asian Institute of Technology in Bangkok. Studies relating to stormwater collection, river pollution, and sewage treatment have been made in cooperation with interested authorities; and the results are applicable not only to Bangkok's project but also to other tropical regions. Topics of pertinent research projects include: (1) the anaerobic treatment of tapioca starch waste; (2) characteristics of treatment of Bangkok septic-tank sludge; (3) a Bangkok runoff hydrograph; (4) the ecology of polluted canals in Bangkok; (5) a study of photosynthetic oxygen production in the Chao Phya River; (6) pollution of the Chao Phya River, Bangkok; and (7) oxygen balance in the Chao Phya River estuary. Research is also proceeding on industrial waste treatment in Southeast Asia including studies on design criteria for waste stabilization ponds and sludge drying beds, and the progress of biological assimilation of wastes in a tripical climate. Water treatment is another area currently being investigated.
W71-06635

REPORT OF COMMISSION TO INQUIRE INTO ALLEGED NUISANCES IN AUCKLAND METROPOLITAN DRAINAGE DISTRICT.

New Zealand House of Representatives, 1965. 32 p.

Descriptors: *Sewage treatment, Evaluation, Remedies.
Identifiers: *New Zealand.

This report, on the investigation of nuisances caused by midges and offensive odors at the Mangere sewage works of the Manukau Sewerage Scheme, Auckland, deals with the causes of these nuisances, possible methods of elimination, and the necessity for legislation. Since much of the nuisance is attributable to the sewage reaching the works in a stale condition, it is recommended that the Orakei combined sewerage system be cleaned at least once a year, regular sampling be carried out during periods of low flow, provision be made for the injection of compressed air at each pumping plant to minimize septic conditions in the pressure mains, and the inverted siphons be flushed at least once a week during the dry season. Certain modifications are also recommended at the sewage works, including the covering of preliminary aeration and primary sedimentation tanks, the use of percolating filters to regulate the load on the oxidation ponds, and the reduction of recirculation of effluent to increase the period of sedimentation and the amount of sludge digested. In view of the increasing population, the design load of the works for a population of 800,000 will possibly be reached by 1986; and since the existing oxidation ponds cannot be extended economically, investigations are necessary to determine the best process for the extensions. It is proposed to consider the activated-sludge process.
W71-06637

ON THE CONCEPT OF MUNICIPAL SEWERAGE SYSTEMS,
H. Fathmann.
IWL Forum 66/1, p 1-23, 1966.

Descriptors: *Sewage treatment, *Costs, *Drainage systems, *Equipment, Design.

The author deals with various problems which are encountered in the design and operation of sewage works for local communities. Particular reference is given to the cost of drainage systems and mechanical treatment plants, the control of storm sewage overflows, the operation of screens, detritus, sedimentation and humus tanks, and the advantages of percolating filters and activated-sludge plants.
W71-06654

PROPOSED FEDERAL FUNDING FOR CONSTRUCTION OF COMMUNITY WATER AND SEWAGE FACILITIES.
For primary bibliographic entry see Field 06E.
W71-06689

PRACTICAL ASPECTS OF THE DESIGN OF WASTE STABILIZATION PONDS,
Wooton (L.E.) and Co., Raleigh, N.C.
W. D. Barlow.

Ninth Southern Municipal and Industrial Waste Conference Proceedings (North Carolina State University, Raleigh, North Carolina, April 7-8 1960) p 65-74, Technical Press, Raleigh, North Carolina, 1960.

Descriptors: *Lagoons, *Domestic wastes, Waste water treatment, Industrial wastes, Nutrients, Bacteria, Algae, Treatment facilities, Test procedures, Metals.
Identifiers: *Finishing wastes.

Lagoons can be designed to provide complete treatment for any waste water, domestic and/or industrial, provided it contains the necessary nutrients and is free from substances which are toxic to bacteria or algae. The author discusses the basic processes involved; factors affecting the design and operation of the lagoon (particularly under conditions in North and South Carolina); performance of the lagoon, including methods of measurement; and precautions to be taken to avoid health hazards, pollution and other nuisance problems. In discussion, reference was made to lagoons used for treating mixed waste waters and 20-30 percent of domestic sewage, and especially to the problems encountered which appear to be caused by toxic metals in the waste water. (Livengood - North Carolina State University)
W71-06737

COMBINED TREATMENT OF TEXTILE AND DOMESTIC WASTE,
Cannon Mills, Kannapolis, N.C.
John L. Brown.
Southern Municipal and Industrial Waste Conference Proceedings (North Carolina State University, Raleigh, North Carolina, April 1-2, 1957) p 179-186, Technical Press, Raleigh, North Carolina, 1957.

Descriptors: *Standards, *Legislation, *Waste water treatment, Domestic wastes, Treatment facilities, Lagoons, Trickling filters, Settling basins, Chlorination, Sludge digestion, Textiles.
Identifiers: *Textile wastes, Sodium hydroxide.

Steps taken by Cannon Mills Company to treat plant waste to comply with state stream pollution laws are described. The treatment plant consists of the following units: a storage lagoon for caustic waste, primary settling tanks, two-stage trickling filters, secondary settling tanks, a Cl contact tank, and a sludge digestor. The combined waste being created through the plant is about 60% textile waste and 40% domestic sewage. (Livengood - North Carolina State University)
W71-06740

TARGET DATES FOR SECONDARY TREATMENT AND STORMWATER SEPARATION ON LOWER MISSOURI AND MISSISSIPPI RIVERS,
Glen J. Hopkins.
Paper presented at the annual meeting of the Missouri Water Pollution Control Association, Jefferson City, Missouri, February 23, 1970.

Descriptors: *Water pollution sources, *Pollution abatement, Missouri River, *Mississippi River, *Surface runoff, Water pollution, Sewage treatment, Separation techniques, Overflow, Waste water treatment.
Identifiers: *Agricultural land runoff, Combined sewers.

Sources and effects of pollution in the lower Missouri and Mississippi Rivers are discussed, and reasons for opposing secondary treatment and storm sewer separation for this area are explained. He states that sufficient pollution abatement has already taken place in these rivers and that communities need not waste tax dollars supporting federal grants for further pollution prevention facilities. According to Mr. Hopkins, the Missouri River can assimilate wastes properly with the treatment that is presently offered. He also asserts that sewered wastes, municipal and industrial, and combined sewer overflows cause far less pollution to the rivers than does surface runoff from agricultural lands upstream. Cost of sewer separation for this area is estimated to exceed $250 million.
W71-06744

WATER RESOURCES AS AN ELEMENT OF URBAN PLANNING,
For primary bibliographic entry see Field 05B.
W71-06753

SYSTEM DESIGN,
For primary bibliographic entry see Field 08B.
W71-06756

WOOL GREASE RECOVERY FROM SCOURING EFFLUENT,
Head Wrightson and Co., Ltd., Thornaby (England).
E. B. Chandler.
Patent No 964,430, July 22, 1964.

Descriptors: *Flocculation, Filtration, Chemical precipitation, Waste water treatment.
Identifiers: *Wool scouring, *Wool grease, *Calcium chloride.

Waste water from wool scouring, containing up to 2% of grease at a pH of 10-12 and an oxygen demand of 3-4000 p.p.m. as determined by a four hour permanganate test is treated with calcium chloride so as to give a residual hardness of 1-4000 p.p.m. To improve flocculation and subsequent filtration small amounts of polyelectrolytes or other aids may be added. After removal of solid materials by means of vacuum filtration the waste water contains 10-40 p.p.m. grease and has an oxygen demand of 600-1200 p.p.m. by the permanganate test. The grease may be recovered from the filter cake by solution in chlorinated organic solvents. (Work-North Carolina State University)
W71-06782

AREAWIDE WATER AND SEWER PLAN.
Harrison City Planning Commission, Ark.
For primary bibliographic entry see Field 04A.
W71-06788

WATER AND SEWERAGE FACILITIES PLANNING PROGRAM FOR MADISON, ST. CLAIR AND MONROE COUNTIES, ILLINOIS. PHASE I-PROGRAM DESIGN.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 06B.
W71-06794

A SIMPLIFICATION OF TEXTILE WASTE SURVEY AND TREATMENT,
Wesleyan Univ., Middletown, Conn. Industrial Waste Lab.
J. W. Masselli, N. W. Masselli, and M. G. Burford.
Wesleyan University, Middletown, Conn, 1959. 68 p, 15 fig, 18 tab, 41 ref.

Descriptors: *Water pollution sources, *Water pollution control, *Data collections, *Waste water treatment, Cotton, Pollution abatement, Evaporation, Incineration, Coagulation, Calcium chloride, Activated sludge.
Identifiers: *Pollution load, *Textile mill wastes, Finishing wastes, Wool, Desizing wastes, Kiering wastes, Scouring wastes, Washing wastes, Waste water segregation, Waste water analysis, Dyehouse waste.

This report contains an outline of the processing methods and sources of pollution in the finishing of cotton, wool, and man-made fibers; advice on the simplification of pollution survey methods in the textile industry; an assessment of the range of pollution load from specific processes; and suggestions on the reduction of pollution load and simplification of methods for treating the waste waters. In cotton mills, most of the pollution results from desizing and kiering operations, and in woolen mills, from scouring and washing after fulling; and it is emphasized that the first step towards pollution control should be the modification of processes to segregate these wastes as a single concentrated waste water which would require only small storage capacity to permit equalization of the discharge of BOD over 24 hours instead of shock loads and would also separate the toxic and other troublesome constituents of the weaker effluents which are normally responsible for the great variability in textile waste waters and prevent adequate treatment. The segregated concentrated waste water could be treated by evaporation followed by incineration. The woolen mill waste could be treated by chemical coagulation with calcium chloride and the cotton mill waste, after dilution, by biological filtration or the activated-sludge process. The pollution loads of the remaining weaker effluents, and also of the waste waters from the finishing of man-made fibers, are entirely due to chemicals used in processing; suitable chemicals should therefore be developed which have lower BOD values or are easily removed from the waste waters. Other research should include the development of methods for recovering materials from the waste waters or utilizing the waste waters; the collection of data on the BOD of processing chemicals; and basic research on the reactions of substances primarily responsible for the BOD of the waste waters (principally glucose, soap, and natural impurities). Numerical data are appended on the composition and BOD of the various processing chemicals, the analysis and pollution potential of typical waste waters, and the removal of BOD by chemical coagulation. (Livengood-North Carolina
W71-06800

ODOR CONTROL IN CATTLE FEED YARDS,
For primary bibliographic entry see Field 05G.
W71-06803

ACCELERATION OF NATURAL DRYING OF POULTRY MANURE THROUGH MECHANICAL AGITATION,
California Univ., Davis.
For primary bibliographic entry see Field 05G.
W71-06804

CONTROLLING ODORS FROM CATTLE FEED LOTS AND MANURE DEHYDRATION OPERATIONS,
Memphis Cattle Feeders, Inc., Millington, Tenn.
For primary bibliographic entry see Field 05G.
W71-06805

USE OF SOIL TO TREAT ANAEROBIC LAGOON EFFLUENT: DESIGN AND OPERATION OF A FIELD DISPOSAL SYSTEM,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
Dale H. Vanderholm, and Craig E. Beer.
Transactions of the American Society of Agricultural Engineers, Vol 13, No 5, p 562-564, Sept-Oct 1970. 1 tab, 2 fig, 17 ref. OWRR Project A-021-IA (3).

Descriptors: *Farm wastes, *Disposal, *Anaerobic digestion, *Irrigation systems, Runoff, Farm lagoon, Livestock, Pollutants, Biochemical oxygen demand, Chemical oxygen demand, Nitrogen, Odor, Storage capacity.
Identifiers: *Land requirements, Livestock wastes.

The study was initiated to investigate the pertinent variables involved and evaluate the performance of an irrigation system for the disposal of livestock waste. It was desired to determine irrigation rates, frequencies, and quantities that would result in satisfactory renovation of the lagoon effluent with no detrimental effects. The results indicate, that for waste-water irrigation, the tabulated rates for clear water are too high and should be reduced, possib

30 to 50 percent. The average COD removal was 97 percent. Smaller applications made more frequently were the most efficient for COD reduction. 80 percent of the nitrogen is removed. 99 percent of the phosphates were removed. This method of waste disposal appears feasible. The results of the study indicate an optimum level for the observed soil and climatic conditions of about 2 in. of lagoon effluent per week during the growing season. (Christenbury-Iowa State)
W71-06806

NDIAN UTILIZES NOVEL MANURE DISPOSAL SYSTEM,
Patel Poultry Farm, Boroda (India).
Jawahar D. Patel.
Poultry Digest, Vol 26, p 100-101, 1967.

Descriptors: *Farm wastes, *Methane, *Gases, Anaerobic digestion, Fertilizers, Odor, Temperature, Disposal, Poultry, Fuels.
Identifiers: India, Working details.

An anaerobic digester that converts poultry manure into useful methane gas is being utilized in India. Poultry manure gives 1.5 to 2.0 cu. ft. of gas per pound in a short period of digestion and at a temperature of 35 degrees C. 35.3 cu. ft. of methane is equivalent to 2.2 kilowatt-hours of electrical energy. The digested manure is a valuable fertilizer because it supplies not only nutrients such as nitrogen, phosphorus, potash, iron, copper, cobalt, maganese, calcium, magnesium, etc., in a well-balanced proportion, but also most valuable humus to plants for successful crop production. (Christenbury-Iowa State)
W71-06807

POULTRY LITTER AS CATTLE FEED,
Missouri Univ., Columbia. Dept. of Animal Husbandry.
Melvin Bradley, and Walter Russell.
Feedstuffs, Vol 37, No 8, p 59-60, February 20, 1965.

Descriptors: Farm wastes, Legal aspects, Feeds, Missouri, Poultry, Hazards, Efficiencies.
Identifiers: Broiler litter, Bloat, Rate of gain.

This article reviews the literature on feeding of poultry litter to beef cattle, discussing hazards and legal implications and giving recommendations if litter is used as a feed. Research is reviewed from Texas, Arkansas, Georgia and Virginia. (Christenbury-Iowa State)
W71-06808

BOD OF CAPTIVE WILD ANIMAL WASTES,
Tulane Univ., New Orleans, La. Dept. of Civil Engineering.
J. W. Macdonald, and H. R. Davis.
Water and Sewage Works, Vol 113, February 1966, p 64-67. 2 tab, 2 ref.

Descriptors: *Biochemical oxygen demand, Animals, Animal wastes (Wildlife).
Identifiers: *Wild animals, *Zoo, Total solids, Captive animals, Primates.

The findings of an analysis of the animal waste from a zoo are reported. The total solids and the BOD per pound of animal are reported. The results of this study may well serve as a guide in the design of plants for the disposal of wild animal wastes. (Christenbury-Iowa State)
W71-06809

PROCEEDINGS OF FARM ANIMAL WASTE AND BY-PRODUCT MANAGEMENT CONFERENCE.
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05G.
W71-06810

CONSIDERATIONS IN SELECTING DAIRY MANURE DISPOSAL SYSTEMS,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W71-06819

ENGINEERING RESEARCH ON FARM ANIMAL MANURE,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W71-06820

NATION-WIDE RESEARCH ON ANIMAL WASTE DISPOSAL,
Federal Water Pollution Control Administration, Chicago, Ill. Lake Michigan Basin Office.
For primary bibliographic entry see Field 05G.
W71-06821

THERE'S HOPE AHEAD,
Wisconsin Univ., Madison. Dept. of Poultry Science.
For primary bibliographic entry see Field 05G.
W71-06823

WASTE DISPOSAL--WATER TREATMENT PLANTS (JOINT DISCUSSION).
For primary bibliographic entry see Field 05E.
W71-06846

THE LARGEST BIOLOGICAL SEWAGE-TREATMENT PLANT ON THE CONTINENT.

Ber Abwassertech Ver (BABVAS), Vol 18, No 2, V, 1967.

Descriptors: *Biological treatment, *Sewage treatment, *Sludge treatment, Channels, Waste water treatment.
Identifiers: Germany.

An account is given of plans for a large biological treatment plant to be built in Essen, Germany, to deal with the increasing quantities of sewage to relieve the existing Emscher plant. The new plant will be able to treat a load of 20 m cubed per second, and during rainfall this amount can be increased to 30 m cubed per second. Provisions have also been made to construct the influent and effluent channels of the mechanical stage in such a way that a loading of up to 45 m cubed per second would be possible. The section where the preliminary treatment is carried out is to be built below ground so that incoming sewage can enter without pumping; the biological stage will then be built above ground and the sewage will be pumped into individual tanks accomodated in 3 buildings. The plan for separate units applies to the whole plant for convenience of necessary repairs. Special provision is made for the separation of oil. Oxygen is supplied mechanically to the aeration tanks, which will have a total volume of 180,000 m; the final sedimentation tanks will also have a volume of 180,000 m cubed. Primary sludge, amounting to about 60% of the total sludge, is to be transported to the sludge-drying plant in Essen-Karnap via a pressure pipeline. Experiments are at present being carried out on methods for disposal of excess activated sludge.
W71-06847

10,000 FT LONG SEA OUTFALL AT HASTINGS IN SUSSEX.
For primary bibliographic entry see Field 05E.
W71-06848

RE-USING STORM RUN-OFF.

Environ Sci Technol, Vol 2, p 1001-1005, 1968.

Descriptors: *Design, *Cost analysis, Lakes, Potable water, Runoff, Maryland, Waste water treatment, *Water reuse.
Identifiers: *Columbia (Md).

A design and cost study of the 1100-acre Wilde lake watershed in Columbia, Md., which considers the treatment of runoff and its use as potable water, is described. The scheme includes the collection and storage of runoff in 10 small lakes and preliminary treatment there by sedimentation, chemical coagulation, and chlorination.
W71-06849

TRANSMISSION PLANT TREATS 100,000 GPD.

Modern Power Eng, Vol 64, No 6, p 64-66, Jun 1970. 2 tab, 1 diag.

Descriptors: *Waste water treatment, *Sewers, *Sewage treatment, *Industrial wastes, Separation techniques, Water distribution (Applied), Storm runoff.
Identifiers: Interceptor sewer.

Prior to installing General Motors' automatic transmission treatment plant, plans were made for the separation of industrial wastes from other liquid wastes. Separation of sewage and sanitary wastes was accomplished by laying interceptor sewers from washrooms to connect to municipal sewers. Stormwater was separated through the construction of an overhead collection system connected to rainwater leaders from the roof. Clean cooling water from production operations was also pumped into this overhead collector and the contents fed to municipal storm systems. Industrial waste purification was accomplished through the installation of the complex waste treatment plant, which is described in detail and which, since September 1968, has passed only treated industrial wastes to municipal sewers.
W71-06850

PHASE 1 EXTENSION WILL CATER FOR EXTRA 1.7 M.G.D. FLOW.

Munic Eng (London), Vol 146, p 756, 1969.

Descriptors: *Sewage treatment, Humus, Sedimentation, Filtration, Waste water treatment.
Identifiers: Great Britain, Storm tank.

An illustrated description is given of extensions in progress to the Tixall sewage works of the Stafford Borough Council, including humus, sedimentation, digestion, and storm sewage tanks, additional percolating filters, and a building to house filter presses. The extended works, which also treats sewage from an area administered by Stafford R.D.C., will have a treatment capacity of 3.6 m.g.d.
W71-06851

COMBINED SEWAGE WORKS OPERATING AT FARINGDON.

Munic Eng (London), Vol 146, p 1221, 1969.

Descriptors: *Sewage treatment, *Storm runoff, *Biocontrol, Waste water treatment.
Identifiers: *Combined sewers, *Effluent discharge, *Biological filtration, Great Britain.

An illustrated description is given of the new sewage works served by a combined sewerage system and provided by Faringdon R.D.C., Berks. Treatment is by biological filtration. The final effluent flows into a stream after discharge to a small irrigation area, and excess stormwater is distributed over a 5-acre seepage site from where it drains to the stream through a clinker bed. Crude sludge is dewatered in drying beds.
W71-06852

FULL TREATMENT CAPACITY INCREASED TO 3.36 M.G.D. BY 29,000-POUND EXTENSION.

Munic Eng (London), Vol 145, p 2090, 1968.

Descriptors: *Sewage treatment, Sludge disposal, Waste water treatment.
Identifiers: *Great Britain, Capacity, Storm sewage.

Recent extensions to the sewage works of Fleet, Hants., which have increased capacity to a dry-weather flow of 1.12 m.g.d., are described. Additional facilities include sludge-drying beds with mechanized removal of sludge, and modifications have been made to humus tanks and percolating filters to provide more working volume. The humus-tank effluent passes through microstrainers before discharge and storm sewage overflows are treated on the land before discharge to a stream.
W71-06853

TIVERTON SEWAGE WORKS RECOGNIZES FLOOD HAZARD.

Surveyor, Vol 84, No 4028, p 30-32, Aug 15, 1969. 7 fig.

Descriptors: *Drainage systems, *Sewage disposal, *Sewers, Flood control, *Multiple-purpose projects, *Treatment facilities, Design criteria, Sludge treatment, Sewage treatment, Waste disposal, Waste water treatment.
Identifiers: *Great Britain.

Extensive main drainage and sewage disposal schemes were completed at Tiverton, Devon. Plans involved relaying of the town's sewers, the provision and renovation of pumping stations, and the reconstruction of sewage disposal works. All three aspects of the work are fully described. Previous town sewers consisted of old brick culverts which were badly silted, and infiltration water entered in places. A complicating factor at Tiverton is that the works are susceptible to flooding from the nearby River Exe. This complication was considered in the design of the works, particularly with regard to sludge treatment. To overcome problems of drying sludge, a method of mechanical drying, called sludge pressing, was installed. A mixture of primary, humus, and stormwater sludges is passed to a chemical conditioning tank where lime and ferrous sulphate solutions are added and mixed with the sludge. The pressing, which takes about seven hours, is performed automatically. The entire procedure is outlined.
W71-06855

DUAL PURPOSE SETTLEMENT TANKS AT ANDOVER.

Surveyor, Vol 83, No 4013, p 29 and 44, May 3, 1969. 1 fig.

Descriptors: *Sewage treatment, *Treatment facilities, Design, Sediment control, Pumping plants, Weirs, City planning, Waste water treatment.
Identifiers: *Storm tank, *Storm overflows, *Great Britain.

Andover's new sewage treatment works embodies four unusual design features, namely, dual purpose primary sedimentation and stormwater tanks, double filtration, elutriation, and filter pressing. As a temporary extension, three sedimentation tanks were constructed to deal with an excess dry weather flow. The original pumping station was converted to a stormwater pumping station, and preliminary treatment units were replaced by an inlet works composed of coarse screens, a bypass channel, flow controlling weirs, and a storm overflow chamber. Flows up to 3 d.w.f. pass to the new main pumping station. Flows between 3 and 6 d.w.f. surcharge and pass to the old station converted for stormwater pumping. Flows exceeding 6 d.w.f. discharge into existing stormwater tanks. The rectangular sedimentation and stormwater tanks were combined into one unit of eight tanks, four back-to-back with a gallery between. Advantages of this system are cited. Descriptions are given of the previous facilities, effluent requirements, temporary extensions, the new main pumping station, the pumping main, the treatment works, primary and secondary treatment, final settlement, sludge digestion, elutriation and conditioning, filter pressing, and landscaping architecture.
W71-06856

ASHFORD (KENT) SEWAGE WORKS AFTER FOUR YEARS.

Surveyor, Vol 83, No 4000, p 38-41, Jan 31, 1969. 3 fig, 1 tab.

Descriptors: *Construction, *Design, *Operations, *Sewage disposal, *Treatment facilities, *Sewage treatment, *Controlled drainage, *Sludge treatment, *Effluents, Storm runoff, Waste water treatment.
Identifiers: *Great Britain.

Major items are presented from a longer paper that described in detail the design, operation, and problems involved in construction of the Bybrook Sewage Disposal Works at Ashford in Kent. In one town served by the old Bybrook works, flows exceeding 6 d.w.f. discharged directly to the old River Stour. Old stormwater storage tanks, previously serving Bybrook only, were improved and a short weir constructed so that all flows pass through both tanks before discharge to the river. Two auto sludge scraping mechanisms aid removal of sludge which is returned along with the tank contents by a stormwater pump to the works for full treatment. The following topics relating to the new disposal works are discussed: trade wastes, the standard of effluent, inlet works, settlement tanks and filters, humus tanks, the irrigation area, stormwater, sludge treatment, commissioning techniques, percolating filters, the digestion plant, mechanical plant problems, the pumps' insides and filter arms grounding. The paper concentrates on early operational problems, but notes that the disposal works' effluent has proven to be excellent.
W71-06857

FARINGDON RDC NEW SEWAGE WORKS.

Surveyor, Vol 82, No 3980, p 54-56, Sep 13, 1968. 5 fig.

Descriptors: *Treatment facilities, *Sewerage, *Sewers, *Overflow, *Controlled drainage, Storm runoff, Waste water treatment.
Identifiers: *Combined sewers, *Storm sewers, *Great Britain, Capacity.

A conventional treatment plant of modern design and large capacity, plus a new and extensive sewerage system replaced a formerly overloaded system at Faringdon in the Berkshires. Additional sewers were provided to relieve the existing system from surcharge and from extremely heavy flows from a new relief road constructed to overcome flooding. Faringdon has a combined sewerage system which must be of a size and capacity sufficient to handle the heaviest storm. The sewage disposal works and sewers leading to the works were designed to handle 3 x dwf. Provision was made for flows over 3 x dwf by constructing large diameter sewers which operate immediately when combined sewers run over. The stormwater sewers do not flow to the disposal works, but discharge onto a stormwater irrigation area. Advantages of this system over the previous one are reported. The new treatment works is described in general, in addition to the procedure used to treat storm flows over 3 x dwf.
W71-06858

LAUNCHING A TWO MILE SEWAGE OUTFALL.

For primary bibliographic entry see Field 05E.
W71-06859

NEW SEWAGE DISPOSAL WORKS FOR OAKENGATES U.D.C.

Surveyor Munic City Engrs, Vol 129, No 3920, p 31-32, 1967.

Descriptors: *Sludge treatment, *Sewage treatment, Waste water treatment.
Identifiers: *Great Britain, *Storm tank, *Biological filtration.

An illustrated description is given of a new sewage works at Oakengates, Salop., which provides complete treatment by biological filtration for up to 3 times the dry-weather-flow of 0.8 m.g.d. Primary sludge and sludge from stormwater tanks are discharged to thickening tanks, and secondary sludge is returned for treatment or pumped to the thickening tanks if required. After thickening, sludge is dewatered on beds.
W71-06860

AWARD WINNING INDUSTRIAL WASTE TREATMENT PLANT.

Water Pollution Control, Vol 107, No 7, p 18, Jul 1969.

Descriptors: *Waste water treatment, Ponds, Storm runoff.
Identifiers: *Stormwater pond.

Chrysler's industrial waste treatment plant handles combined storm and industrial waste water. The plant is designed to remove and dispose of free and emulsified oils, detergents, caustic strippers, and acid rinses. A stormwater holding pond of three million gallons stores excess flow from the industrial plant under storm conditions. Exceptionally long and heavy rainfalls could cause the pond to overflow; however, a sufficient detention time would still allow suspended solids to settle out. Stored stormwater is treated later when the plant sewage load has decreased.
W71-06861

RECOVERY OF ZINC SULPHATE IN THE MANUFACTURE OF HIGH-TENACITY RAYON CORD, (RUSSIAN),

A. T. Serkov, I. N. Kotomina, and V. A. Kolchin.
Khimica Volokna, No 5, p 30-32, 1962.

Descriptors: Waste water treatment, Evaporation, Waste treatment, Fibers (Plant), *Water reuse.
Identifiers: *Viscose rayon wastes, *Rayon tire cords, Tire yarns, Zinc compounds, *Zinc sulfate, *Waste recovery.

An economical method is given for recovering zinc by evaporation from waste waters from the production of viscose rayon tire cord. It involves countercurrent washing of the freshly-formed fibers so that a large proportion of zinc sulphate is removed from them, thus substantially reducing the concentration of zinc sulphate in the subsequent bath and hence reducing the volume of water required for its dilution. The process reduces the loss of zinc sulphate to 0.03 kg per kg of fibers, the bulk of zinc sulphate recovered being returned to the spinning bath. A similar process can be applied to the recovery of zinc from effluents produced during the manufacture of other types of viscose rayon fibers. (Livengood-North Carolina State)
W71-06862

OXFORD SEWAGE TREATMENT PLANT.

Water Waste Treat, Vol 12, No 9, p 280-281, Sep/Oct 1969.

Descriptors: *Treatment facilities, *Overflow, Sewage treatment, Regulation, Waste water treatment.
Identifiers: Great Britain.

Extensions of the Oxford Sewage Treatment Plant were required when overloads reached 2 million gallons per day. Now all flows, after preliminary treatment, are pumped to the inlet channel where two-thirds are sent to the old works and one-third to the new works with peak flow/storm balancing tanks acting progressively above 7,000 g.p.m. The dimensions and workings of new units are described. Additions to the plant include: three peak flow/storm balancing tanks, an aeration plant unit, side wall unit extensions to the original flat bottom tanks, infinitely variable speed pumps serving the return activated sludge plant, two hopper bottom tanks, a secondary sludge digestion unit, and three tanker vehicles for conveying consolidated activated sludge.
W71-06863

NEW PUMPING STATION FOR LIVERPOOL.

Water Waste Treat, Vol 12, No 9, p 297, Sep/Oct 1969.

Descriptors: *Pumping plants, *Treatment facilities, *Pumps.
Identifiers: *Great Britain, *Storm tank.

The new pumping station for Liverpool is part of a major extension program which provides further sedimentation tanks, stormwater tanks, and increased biological filtration capacity. The station is designed to accomodate seven vertical sewage pumps, four of which (dryweather pumps) are arranged so as to deliver sewage through one rising main to the primary sedimentation tanks. The three remaining pumps (stormwater pumps) deliver sewage through a second rising main to the stormwater tanks. The operation and output of the pumps are described. Ultraviolet lamps are used to suppress odor and retard any fungoid growth which may occur in the pump house basement.
W71-06864

INSTRUMENTATION AND CONTROL AT DALMARNOCK SEWAGE DISPOSAL WORKS.

Water Waste Treat, Vol 12, No 1, p 19-20, May/Jun 1968.

Descriptors: *Sewage treatment, *Flow measurement, Sludge treatment, Effluents, Waste water treatment.
Identifiers: *Scotland.

The instrumentation and control provided by the Lea Recorder Co. for the new activated-sludge plant at Dalmarnock, Glasgow, are described in detail. Provision has been made for automatic sampling at various stages of treatment, as well as for the control and recording of the flows of sewage, stormwater, and effluent. The final effluent is discharged to the River Clyde.
W71-06865

WATER RE-USE.

Chem Eng Program, Symposium Series, Vol 63, No 78, 1967. 284 p.

Descriptors: *Water reuse, *Water pollution control, *Waste water treatment, *Application methods, *Analytical techniques, Design, Sewers, Sewage treatment.

This publication contains the papers presented at the 59th annual meeting of the American Institute of Chemical Engineers in Detroit, Michigan, during an international conference on the conservation of waste water by reuse, and additional papers from other meetings of the Institute are also included to give broad coverage of the subject. Information on the reuse of waste water for industrial or municipal supplies is presented for 9 countries and consideration is also given to the role of water reuse in the prevention of pollution, management of water resources, and design of sewerage systems; medical, legal, and economic aspects; internal reuse of water in factories; treatment for reuse, including the use of chemicals, ionizing radiation, activated carbon, and biological processes; removal of viruses, phosphates, and nitrogen compounds; reuse in spaceships; recovery of chemicals; analytical techniques; disposal of sludges; and complete reuse of all waste waters including storm sewage.
W71-06866

PROBLEMS OF WATER TREATMENT IN DEVELOPING COUNTRIES,
D. Anderson.
Effluent Water Treat, Vol 8, No 10, p 513-516, Oct 1968.

Descriptors: *Waste water treatment, Waste water (Pollution), Sewage, Public health.
Identifiers: Developing countries.

There will be an increase in the volume of waste water and in the concentration of pollutants due to the increase in the total use of water for municipal, agricultural, and industrial purposes. The problems created by this increase include: development of water resources investigating river morphology and irrigation; sewage waste stressing the reduction of the oxygen consumable in sewage; trade waste water caused by a rapid program of industrialization; equipment and processes wherein design standards used in industrial countries were also applied to developing countries, citing the installation of a treatment plant and an inadequate stormwater system; water and waste water management; and water-borne disease. Research information is needed for combatting the water treatment problems.
W71-06867

EXTRACTS FROM THE ANNALS OF A SEWAGE-WORKS MANAGER, 1950-1966,
T. A. Austin.
Paper presented at a meeting of the Institute of Water Pollution Control, Birmingham, November 1967.

Descriptors: *Sewage treatment, Effluents, Water pollution, Water reuse, Investigations, Biochemical oxygen demand, Waste water treatment.
Identifiers: *Great Britain, Storm sewage, Suspended solids.

An historical account is given of the development of sewage works at Leamington Spa with special reference to the problems encountered. Aspects considered include: the system adopted for charging, conveying, and treating trade waste waters; raising of weirs on storm sewage overflows to overcome pollution of the River Leam; and experiments on the treatment of effluent to permit reuse for industrial purposes. The works now serve a population of 58,000 and treat an average flow of 4.5 m.g.d., with an efficiency of 93.7 per cent (based on BOD). In view of continually increasing loads, a scheme is being developed for a new works, together with a new Avon valley sewer. Trials were carried out using spray-irrigation of screened sewage on grass plots with underdrains which removed 89 per cent of the BOD and 95 per cent of the suspended solids.
W71-06868

SEPARATION OF SEWAGE FROM STORMWATER,
V. W. Bacon, R. Leland, and B. Sosewitz.
In: Symposium on Storm Sewage Overflow, Inst of Civil Engrs, p 143-152, 1967.

Descriptors: *Sewers, *Water pollution sources, Storage, Design, Illinois.
Identifiers: *Storm sewage, *Chicago.

In the U.S., since the conversion from existing combined sewage systems to separate systems would not be economical, various alternate methods of preventing pollution by storm sewage have been investigated. The Chicago underground storage plan followed by back-pumping to surface reservoirs for sedimentation and chlorination is discussed.
W71-06869

ROTARY VIBRATORY FINE SCREENING OF COMBINED SEWER OVERFLOWS; PRIMARY TREATMENT OF STORM WATER OVERFLOW FROM COMBINED SEWERS BY HIGH-RATE, FINE-MESH SCREENS,
Donald M. Marske.
In: Combined Sewer Overflow Abatement Technology. Water Pollution Control Research Series, Report 11024--06/70, p 57-106, Jun 1970. 13 fig, 6 tab, 2 ref.

Descriptors: *Sewage treatment, *Overflow, *Storm runoff, *Screens, Economic feasibility, Treatment facilities, Waste water treatment.
Identifiers: *Combined sewers.

The feasibility, effectiveness, and economics of employing high-mesh screening for primary treatment of stormwater overflow from combined sewer systems is detailed herein. Based on final performance tests run on dry-weather sewage, the unit (63 inches high and an outside diameter of 80 inches) is capable of 99% removal of floatable and settleable solids, 34% removal of total suspended solids, and 27% removal of COD. The screened effluent is typically 92% of the influent flow. The estimated cost of treatment is 22 cents/1000 gallons for a scale-up design of a 25 mgd screening facility. It was observed that the proposed screening facility required 1/10 to 1/20 the land required by a conventional primary treatment plant. (See also W70-09558)
W71-06870

THE DESIGN AND CONSTRUCTION OF REGIONAL SEWERAGE AND SEWAGE TREATMENT WORKS FOR LIVINGSTON NEW TOWN INCLUDING ITS ENVIRONS AND FOR THE NEWBRIDGE AREA,
T. A. C. Brownlie, and W. Ferguson.
J Inst Public Health Engrs, Vol 68, Part 3, p 160-188, Jul 1969.

Descriptors: *Sewerage, Sewage treatment, Design, Overflow, Waste water treatment.
Identifiers: *Storm sewers, *Combined sewers, Treatment methods, Storm tank, Great Britain.

Described in detail are plans for Livingston New Town and its environs and Newbridge. Separate sewers were adopted for the New Town while existing combined systems were re-sewered for separation only when redevelopment took place. Overflows were suggested where major existing sewers were to be connected to newer sewers, and at least 6 d.w.f. will be passed to the new sewer. Primary tanks of the existing sewage treatment works will be converted to storm water tanks and pumps installed to convey stored sewage back to the new sewer. No flows below 18 d.w.f. should reach rivers without treatment. Surface water storm sewers will be built according to the size necessary to drain the 'once a year storm,' even though rain of this intensity and duration is not likely to occur more than once in three or five years. Descriptions are given of the size, capacity, and model of treatment and operation for the numerous parts of the sewage treatment plants proposed. No storm water settling tank is envisaged for the first development, and future expansion and increase in population will determine whether a storm settling tank is required. Partial treatment of 6 x d.w.f. or more will be possible. Capital and operating costs for both treatment plants are tables as are data concerning capacities and dimensions of each treatment mechanism.
W71-06871

HYDROGEOLOGIC STUDIES ARE KEY TO SAFETY IN WASTE MANAGEMENT PROGRAMS,
For primary bibliographic entry see Field 05E.
W71-06872

CITY OF NORWICH SEWAGE WORKS,
P. Cotton.
Water Pollution Control, Vol 67, No 4, p 454-457, 1968.

Descriptors: *Sewage treatment, *Biocontrol, *Sludge treatment, Waste water treatment.
Identifiers: *Great Britain, *Biological filtration, Storm tank.

An illustrated description is given of the sewage works of Norwich, which are designed to treat a dry-weather flow of 7.5 m.g.d. by biological filtration with recirculation of effluent. Flows in excess of three times design flow are settled in storm tanks. Sludge is thickened by sedimentation before digestion and digested sludge is passed to a storage lagoon before being dried on beds, disposed of on land in liquid form, or distributed by tanker to surrounding farms.
W71-06873

MICROSTRAINING OF SEWAGE EFFLUENTS IN THE USA,
E. W. J. Diaper, and M. R. Lowndes.
Effluent Water Treat, Vol 10, No 6, p 323-325, 327, 328, Jun 1970.

Descriptors: *Filtration, *Waste water treatment, *Pollution abatement, Pollutant identification, Economic justification, Standards, Legislation, Suspended load, Chlorination, Ozone.
Identifiers: *Microstraining, Storm overflows, Chicago, Lebanon, Ohio.

Emphasis has recently been placed on up-grading effluent standards to maintain, or improve, river quality in lieu of increasing contamination from municipal and industrial discharges. Each state must formulate standards for waste water treatment as a result of legislation introduced by the Federal Government. Increased attention has been paid to the compounds of phosphorus and nitrogen in effluents since these chemicals provide nutrients for plant life in the receiving stream. The basic operating principles of a typical microstraining installation are reviewed. The article outlines the results from three investigations in which microstraining has been assessed as an economic aid in preventing pollution in: (1) Lebanon, Ohio - where methods of removing suspended matter that tend to overload advanced waste treatment processes were explored; (2) Chicago - where the necessary tertiary treatment stage at three plants is being being determined in order to meet state standards; and (3) the Cochrane Division of the Crane Co. - where the removal of suspended solids in stormwater overflows by microstraining and the reduction of bacteria in these effluents by chlorination and ozonation are being evaluated.
W71-06874

NEW APPROACHES TO WASTE WATER TREATMENT,
E. W. J. Diaper, and Russel L. Culp.
J Sanit Eng Div, Am Soc Civil Engr, Vol 95, No SA 5, p 978-980.

Descriptors: *Sewage treatment, Storm runoff, Waste water treatment.
Identifiers: Combined sewers, Philadelphia.

In his comments, E.W.J. Diaper mentions the fact that the combination of microstraining and ozonation for the treatment of combined sewer stormwater overflows is being evaluated in Philadelphia, Pennsylvania.
W71-06875

NEW ACTIVATED SLUDGE PLANT TO SERVE THREE WARWICKSHIRE VILLAGES,
Brian M. Dubleton.
Surveyor, Vol 82, No 3972, p 31-33, Jul 19, 1968. 5 fig.

Descriptors: *Sewage treatment, *Treatment facilities, *Separation techniques, Sewers, Drainage programs, Design, Overflow, Waste water treatment, *Activated sludge, Sludge.
Identifiers: *Great Britain, Trunk sewer, Storm tank.

The Atherston Rural District Council constructed a new sewage treatment works and installed several miles of trunk sewers to supercede three existing, overloaded works and to provide for mains drainage in two towns not previously sewered. An activated sludge plant was also proposed for construction. The partially separate sewers in most of the villages were adequate for even anticipated future flows, but in a few instances where surcharging occurred, new sewers were laid. In one area, storm overflows on the sewers were considered to reduce flow to the new works, but separation at the site of the works was found to be preferable. A complete description of the design of the new works is given. Storm tanks can hold the equivalent of 12 hours d.w.f. At times of very heavy rainfall, tanks overflow to Penmire Brook. After a storm, contents of the tanks are returned to the pumping station to be lifted to the works for treatment. The treatment process and sludge handling are described.
W71-06876

SUBMARINE PIPELINE TO DISCHARGE TREATED EFFLUENT AT SPILSBY RDC,
Nigel East.
Surveyor, Vol 85, No 4053, p 38-40, Feb 13, 1970. 10 fig.

Descriptors: *Sewage treatment, *Treatment facilities, *Separation techniques, *Steel pipes, Construction, Outlets, Storm runoff, Sewers, Sewerage, Effluents, Waste water treatment, Waste disposal.
Identifiers: *Great Britain, Storm tank.

Spilsby RDC's sewerage scheme involves two sewage treatment works and construction of a 1.5 mile outfall sewer to dispose of effluent from both works. In one works, storm flows exceeding 3 d.w.f. are separated and passed to storm tanks and additional flows screened only before passing to the final effluent sump. The previous raw sewage, stormwater, and effluent pumping plant was augmented and the filter distributer arms replaced with others of greater capacity. The outlet sewer system was revised to take the effluent to the submarine outfall. Modifications of the second works provided a degree of treatment similar to that at the first works. The bitumen enamel-coated steel submarine pipeline is described in addition to methods used for trench excavation and launching.
W71-06877

TREATMENT OF URBAN STORMWATER RUNOFF,
F. L. Evans, E. E. Geldreich, S. R. Weibel, and G. G. Roebeck.
J Water Pollution Control Fed, Vol 40, No 5, Res Suppl, R162-170, 1968.

Descriptors: *Sedimentation, *Chlorination, Laboratory tests, Microorganisms, Waste water treatment, Ohio, *Storm runoff, Urbanization.
Identifiers: *Cincinnati, Runoff treatment.

Tabulated and graphical results are given of laboratory studies on treatment by sedimentation and chlorination of runoff from an unban area of Cincinnati which is sewered on the separate system. Plain sedimentation for less than one hour was not effective in reducing COD, BOD, concentrations of nitrogen, phosphate and solids, or the total counts of three bacterial indicators, but improved removals were obtained with sedimentation for four hours. A dose of 2-6 mg of chlorine per litre applied for 20 min was necessary to effect a 99.99 per cent kill of total coliform organisms, faecal coliform organisms, and faecal streptococci. Even with such high doses of chlorine and the presence of free residual chlorine after treatment, aftergrowth of total coliform organisms occurred in 24-72 hours; however, there was no significant aftergrowth of faecal organisms. From these results it is suggested that the count of faecal coliform organisms rather than total coliform organisms is more realistic indicator of the downstream effects of chlorinated discharges.
W71-06878

KAPPALA UNDERGROUND SEWAGE WORKS, STOCKHOLM,
E. Isgard, and A. Rosander.
Civil Eng Public Works Rev, Vol 65, No 766, p 517-520, May 1970. 4 diag, 1 map, 1 tab.

Descriptors: *Sewage disposal, *Tunnels, *Treatment facilities, Construction, Planning, Cost analysis, Infiltration, Storm runoff, Waste water treatment, Waste disposal.
Identifiers: *Gravity sewer, Sweden.

Ten suburban communities north of Stockholm formed the Kappala Union to deal with their sewage problems. They planned to convey sewage to a sewage treatment plant on Lidingo Island, enabling effluent to discharge into the main stream of water. Plans are described for the establishment of a system of gravity sewer tunnels to convey waste water to the plant. The flow was intended to consist of municipal sewage and groundwater infiltration without much stormwater. Construction techniques for the sewage tunnels and the treatment plant are discussed, as is the planning of the plant and main pumping station. Total costs for the project are given in a table.
W71-06885

TECHNIQUES AND RECENT DEVELOPMENTS IN SEWAGE WORKS DESIGN,
R. P. Boyd James.
Water Pollution Control, Vol 69, No 1, p 62-66, 1970.

Descriptors: *Sewage treatment, Sludge treatment, Evaluation, Overflow, Waste water treatment.
Identifiers: *Storm tank, *Treatment processes, Storm sewage.

New techniques and developments in three different areas are discussed, the areas being: sewage treatment and its effect on operators and others, the effectiveness of sewage treatment, and the efficiency of the process. Developments in sludge dewatering and aerial nuisance decrease the unattractiveness of sewage treatment to operators and other employees. The advances and deficiencies of tertiary treatment, biological treatment, and preliminary treatment and sedimentation are presented in relation to the influences they have on the effectiveness of sewage treatment. Also in this area, the failings of storm sewage treatment are enumerated, and the author strongly recommends that provisions for storm tanks or irrigation areas be made in order to reduce pollution from overflows. He asserts that it is better to intercept a 40 d.w.f. flow in a storm tank than to give full treatment to a mere 6 d.w.f., allowing the remainder to overflow. F.W. Allen in the 'Discussion,' suggests that storm tank treatment could be improved if full use were made of the storage capacity of sewers and if one storm has no outlet to the river so that the first storm flush could be stored there and later sent back for treatment. He also recommends that overflows sited on a sewer near a trade effluent discharge be upstream of the discharge to allow the trade effluent to pass to the sewage works. New techniques in the efficiency area of sewage treatment are also described in addition to civil engineering developments that speed construction.
W71-06886

SILT REMOVAL FROM COMBINED SEWERS,
D. Laredo, and E. A. Bryant.
Water Sewage Works, Vol 115, No 12, p 561-564, Dec 1968.

Descriptors: *Massachusetts, *Sewage treatment, *Chlorination, Storm runoff, Waste water treatment, Silts.
Identifiers: *Degritting tank, Combined sewers.

At the 50-m.g.d. primary sewage works of Fall River Mass., which is served by combined sewers, a degritting tank and facilities for preliminary additional chlorination have been installed to treat storm flows which previously had to bypass the works because they fouled the sedimentation tanks. The design, operation, and performance of the degritting tank are described.
W71-06887

THE SEWAGE DISPOSAL AT VELDEN ON LAKE WORTHER,
W. Lengyel.
Oesterr Wasserwirtsch (OSWAAI), Vol 20, No 9/10, p 204-210, Sep/Oct 1968.

Descriptors: *Pollution abatement, *Sewage treatment, Pumping plants, Pressure conduits, Waste water treatment.
Identifiers: *Lake Worther, Germany, Combined sewers, Separate system.

To prevent and control polluting loads from entering Lake Worther, additional sewage works were constructed to serve the health resort of Velden. These works provide primary treatment for domestic sewage and trade waste waters in tanks and have facilities for sludge digestion and mixing of sludge and garbage. Owing to the complex geographical conditions of the area, a central pumping station had to be provided to pump the sewage via a long pressure pipe 65 m above water level to the lake. The author outlines the factors which affect the use of combined sewerage systems as compared with separate systems and discusses the advantages and disadvantages. In the case of Lake Worther the separate sewerage system is recommended, but strict control should be kept on the number of dwellings served.
W71-06888

THE UNABATED GROWTH OF WATER POLLUTION ABATEMENT ACTIVITIES,
Austin H. Montgomery, Jr.
Consulting Engr, Vol 33, No 5, p 114-117, Nov 1969. 10 ref.

Descriptors: Methodology, *Pollution abatement, *Sewers, *Costs, *Separation techniques, *Engineering personnel, Water reuse, Waste water treatment.
Identifiers: *Treatment methods.

Water pollution abatement activities were given authority and direction by the Federal Water Quality Act of 1965. An estimated cost of $48 billion is necessary for the separation of combined sanitary and storm sewers. The traditional primary-secondary treatment plants' objectives and achievements usually have been not to restore but to slow down or prevent further degradation. Lack of knowledge of the extent and means of treating pollution sources such as pesticides, acid, erosion, fertilizers, and mine drainage, is a factor in delaying the abatement program. A list of consulting engineering firms, which have been awarded research and development grants and contracts for advanced waste water treatment techniques, is given. The trend in the reuse rather than discharge of waste water is well under way, and the most widespread reuse today is that of secondary treatment effluent as a water source for industry and agriculture. A need for professional water pollution control is emphasized.
W71-06889

SPECIAL OPERATIONAL RESULTS FROM OXIDATION CHANNELS,
J. Muskat.
Oesterr Abwasser-Rundschau (OERAV), Vol 12, No 1, p 3-7, 1967.

Descriptors: *Sewage treatment, Investigations, Nitrification, *Oxidation lagoons, Waste water treatment.
Identifiers: Oxidation channels.

The advantages of oxidation channels for the treatment of sewage are discussed with special reference to the satisfactory results obtained when dealing with shock loads and with rainwater. The principles of action in straight, circular, and mixed oxidation channels are outlined including the difference in the biological conditions of each plant. The importance of dilution for the biocenose in circular channels is considered as well as the factors which affect nitrification and denitrification in straight and in circular channels.
W71-06890

DETROIT'S METROPOLITAN WATER POLLUTION CONTROL PROGRAM - IN ACTION,
For primary bibliographic entry see Field 05G.
W71-06892

DEVELOPMENTS IN STORM AND COMBINED SEWER POLLUTION CONTROL,
For primary bibliographic entry see Field 05G.
W71-06893

TAHOE AND WINDHOEK: PROMISE AND PROOF OF CLEAN WATER,
Frank P. Sebastian.
Paper presented at the Third Annual National Pollution Control Conference and Exposition, San Francisco, California, Apr 1-3, 1970.

Descriptors: *Sewage treatment, *Water purification, *Treatment facilities, *Water reuse, Cost analysis, Waste water treatment.
Identifiers: *Tahoe treatment plant, *Windhoek treatment plant.

Two sewage treatment plants have shown that technology does exist to meet the stringent environmental quality standards on waste water. By 1970, the Tahoe plant will have pumped one and one-half billion gallons of purified waste water into a new reservoir for water sports and irrigation; and, the Windhoek (South West Africa) sewage purification plant, using a different system, will have supplied nearly one-third of the drinking water for a city of 30,000 people for more than a year. The paper presents illustrations, flowsheets, and cost data on the world's two most advanced waste water treatment plants.
W71-06894

THE REUSE OF TREATED MUNICIPAL WASTE BY THE MIDLAND DIVISION, THE DOW CHEMICAL COMPANY,
E. S. Shannon, and A. Maass.
Paper presented at the Am Water Works Assoc, Annual Conference, Washington, DC, Jun 21-26, 1970.

Descriptors: *Sewage treatment, *Chlorination, *Estimated costs, Water supply, *Water reuse, Water quality, Trickling filters, Waste water treatment, Michigan, *Municipal wastes.
Identifiers: *Midland (Mich).

In June 1969, the Dow Chemical Company started to take into its cooling water and fire protection system the treated sewage from the city of Midland, Michigan. The supplemental water supply will provide up to seven million gallons per day of relatively high quality water and the reservoir will provide a three million gallon fire water supply. The Midland waste water treatment system consists of primary, and two stage trickling filter secondary treatment, followed by chlorination. There is also a three million gallon reservoir, two six thousand gallon per minute pumps, and associated controls and piping. The total cost of the project is estimated at $500,000.
W71-06895

SEWERAGE AND SEWAGE TREATMENT,
Ralph Stone.
'Sewerage and Sewage treatment: State-of-the-Art Abstracts,' J Sanit Eng Div, Am Soc Civil Engr, Vol 96, SA1, p 35-48, Feb 1970.

Descriptors: *Waste treatment, *Sewage treatment, *Abstracts, *Waste water treatment, Activated sludge, Aeration, Oxidation lagoons, Ion-exchange, Operating costs.

Abstracts of 13 on-going research projects are given. The summaries consider activated sludge effluent, clarification processes, ecology in waste stabilization ponds, waste water treatment by ion-exchange resins, plant operating costs, fly ash filters, waste water aeration, individual home waste treatment systems, oxygenation, sulphides, and other problems. This paper has been prepared as an activity of the Committee with significant information on waste treatment, inclusive of subjects of research and demonstration projects.
W71-06897

SEWAGE-TREATMENT PLANT,
G. Talon.
Abwass, Vol 14, No 12, p 17-18, 1967.

Descriptors: *Sewage treatment, *Aeration, *Storage tanks, Equipment, Flow control, Waste water treatment.
Identifiers: Compressed-air lift.

Modifications are examined in relation to preliminary aeration equipment in a sewage-treatment plant. The incoming sewage, instead of passing through a grit chamber and storm-sewage overflow, is conveyed directly to a holding tank, inside of which is a container whose upper rim is at the same height as that of the plant itself. A compressed-air lift, mounted in the holding tank above the bottom of the tank, comprises a vertical shaft with aeration jets. This compressed-air life has a two-fold effect: it lifts the sewage into the treatment tank, and it provides primary aeration.
W71-06898

SOME STRUCTURAL DESIGN CONSIDERATIONS IN OXFORD SEWAGE WORKS EXTENSIONS,
M. G. Tassell.
Surveyor, Vol 85, No 4047, p 31-34, 36, Jan 2, 1970. 7 fig.

Descriptors: *Sewage treatment, *Treatment facilities, *Structural design, *Structural engineering, Waste water treatment.
Identifiers: *Great Britain.

Extensions to the Oxford sewage purification works are discussed. The design approach to two widely differing water rataining structures, the primary settlement and storm/balancing tanks and the elevated wash water tank to the sand filtration unit, are considered in some detail. The common thread was the elimination, where possible, of complex stresses either by introducing hinges or movement joints. Shrinkage cracking is more difficult to avoid. Possible methods of reducing such cracking are discussed. The importance of efficient and continuous curing from the moment the shuttering is struck, or in the case of slabs, from the time of initial set is emphasized.
W71-06899

NEW CONSTRUCTION AND PLANS FOR THE TOWN DRAINAGE OF FLENSBURG,
H. Wagner.
Ber Abwassertech Ver (BABVAD), No 17, p 27-37, 1964.

Descriptors: *Design, *Drainage programs, *Sewage treatment, *Sewerage, Sludge treatment, Waste water treatment, *Overflow, Industrial wastes.
Identifiers: *Germany, Slaughterhouse wastes.

After a brief description of existing sewage works for the town of Flensburg, the author outlines plans for expansion of the sewerage water overflow of 960 litres per sec, also receives heavily polluted waste waters from nearby slaughterhouses, increasing the five-day BOD system in this area. The plant, which at present serves a population of 90,000 with a dry-weather flow of 320 litres per sec, and a storm-to 1200 mg per litre. To reduce the heavy load, the plan includes: additional pumping stations at Galwick; the extension of the pressure pipeline to a length of 1450 m; and a treatment plant equipped for the activated-sludge process, with sludge digestion followed by thickening and drying on beds, and disposal at sea by ships.
W71-06900

TREATMENT STUDIES OF COMBINED TEXTILE AND DOMESTIC WASTES,
O'Brien and Gere, Syracuse, N.Y.
D. T. Lauria, and C. A. Willis.
Proceedings, Nineteenth Industrial Waste Conference, May 5-7, 1964, Purdue University, Layfayette, Ind, Part 1, p 45-58, 1964. 11 fig, 3 tab, 9 ref.

Descriptors: *Biochemical oxidation demand, Pilot plants, Waste water treatment, Textiles, Industrial wastes, Treatment facilities, Biological treatment, North Carolina.
Identifiers: *Textile mill wastes, Valdese (NC).

Pilot plant studies were performed to evaluate a low-loading, completely mixed biological process for treatment of combined domestic and industrial wastes produced in the town of Valdese, N.C. Results indicate that B.O.D. reductions of 90 percent can be obtained up to B.O.D. loadings of at least 2.0 pounds per day of B.O.D. applied per pound of sludge. Approximately 38 percent of the B.O.D. is oxidized and 68 percent is converted to new growth. The sludge endogenous respiration rate is about .8 percent per day. These factors result in an oxygen requirement of 0.55 pounds per pound of removed B.O.D. and a net sludge production of 0.35 pounds of solids per pound of removed B.O.D. Becuase of an alpha factor (K sub La mixed liquor/K sub La water) of 0.5 and proposed operating conditions, aerators must be selected to transfer an equivalent of 3 pounds of oxygen to water at 20 deg and O mg/liter oxygen of each pound of oxygen required in the mixed liquor. Required settling tank loading for sludge removal is about 35 pounds per day sludge solids (dry basis) per square foot of surface area, and excess sludge disposal will be by centrifugation and landfill. Chlorine feed machines must be sized for a dosage rate of 10 mg/liter. (Robinson-North Carolina State University)
W71-06917

DOW SURFPAC PILOT STUDY ON TEXTILE WASTE,
Crompton-Shenandoah Co., Inc., Waynesboro, Va.
Duane W. Snyder.
Proceedings, Eighteenth Industrial Waste Conference, April 30, May 1-2, 1963, Purdue University, Lafayette, Ind, p 476-482, 1964. 5 fig, 2 tab, 2 ref.

Descriptors: *Equalizing reservoirs, Waste water treatment, Textiles, Biochemical oxygen demand, *Pilot plants.
Identifiers: *Dow Surfpac (TN), *Textile mill wastes.

The optimum loading at which the BOD reduction can be maintained is 50% or better. The addition of an equalizing pond should extend BOD reduction into the 60-70 percent range, since capacity will be such as to feed the raw effluent to the treatment facility over a seven-day period. The plant is so designed that a 20 percent addition of Surfpac can be added to the tower if future demands require additional treatment. Also the equalizing basis is designed for aeration if desirable sometime in the future. The full-scale plant will include a final clarifier for removal of sludge produced in the oxidation tower. The waste is pumped from the pershall flume to a storage tank continuously, with the overflow going back into the river below the flume. The tank can also act as an equalizing stage, but the prime purpose is to act as a storage in case the sump pump becomes clogged with lint. The raw waste is pumped to the top of the tower and the overflow goes back into the storage tank. (Robinson-North Carolina State University)
W71-06918

REUSE OF EFFLUENT FROM POLYESTER MANUFACTURING OPERATION,
Fiber Industries, Inc.
R. S. Sahlie, and C. E. Steinmetz.
Modern Textiles, Vol 50, No 11, p 21-28, 1969.

Descriptors: *Trickling filters, *Activated carbon, *Chemical wastes, Phosphates, Domestic wastes, *Water reuse, Water pollution sources, Waste water treatment.
Identifiers: *Algae screens, *Chromate reduction unit, Textile millwastes, Polyester plant wastes, Terephthalic acid compounds, Ethylene glycol, Polymer additives, Methyl alcohol, Finishing agents, Ion exchange resins, Chromium compound, Zinc compounds, Biocides, Dowtherms (TN).

The pilot plant project is to be completed in early 1970 and as of late 1969, it is still too early to draw any conclusions. A list of the various sources and kinds of waste is given. Because the wastes vary in concentration of flow, it is necessary to level out these surges in 3 series - connected equalization basins before permitting the chemical wastes to enter the treatment unit. The equalized chemical waste is then combined with the domestic sewage upon entry to the extended aeration activated-sludge system. The water discharged from the plant is of high quality and appears to lend itself to selected reuse in certain unspecified in-plant processes. The plant includes (1) a chromate reduction unit which removes heavy metals from the cooling tower blowdown, (2) a plastic media trickling filter which is installed to evaluate its efficiency in treatment of polyester wastes, (3) algae screens for the removal of all solids above 40 micron size, and (4) a carbon unit for the final polishing of the water. (Robinson-North Carolina State University)
W71-06961

PILOT-PLANT STUDIES OF PROCESSING WASTES OF COTTON TEXTILES,
George A. Hutton, Jr., and Samuel W. Williams, Jr.
Proceeding of the Southern Municipal and Industrial Waste Conference, North Carolina State University, Raleigh, N.C. p 31-43, Technical Press, Raleigh, N.C., 1969.

Descriptors: *Pilot plants, *Lagoons, *Aeration, *Trickling filters, Waste water treatment, Biochemical oxygen demand, Alkalinity, Detergents, Soaps.
Identifiers: *Chemical treatment, *Recovery (Waste), Waste strength, Biological purification, pH, Carboxymethylcellulose, Starch, Mercerizer waste, Sodium hydroxide, Textile mill wastes, Mercerizing.

Pilot plant studies were run to develop special waste-treatment methods to be standardized against the particular situations occurring in large cotton textile mills. It was desired to reduce both the volume and pollutional load of the waste and to make it more susceptible to biological purification. To reduce BOD, pH, alkalinity and other evidences of pollution, a pilot plant system was equipped with lagoons, aeration, chemical preparation, and tricling filters. In-plant changes were made to prepare for the reduction of the pollution load of the waste, e.g., by substituting carboxymethyl cellulose for starch sizes, detergents for soap in the cleaning and dyeing operations, and similar changes in dyes and finishing agents whenever practicable. It was concluded that the most important future installation will be a caustic recovery unit to reduce the alkalinity of mercerizer waste. Experiments proved the cost of chemical treatment of wastes was too high when compared with biological methods. Results of the studies proved that the cost of full-scale industrial waste treatment was cut to less than one-fourth of the previous estimates. (Robinson - Work, North Carolina State University)
W71-06993

DECOMPOSITION OF CELLULOSE XANTHATE AND PRECIPITATION OF HYDROCELLULOSE DURING PURIFICATION OF WASTE WATERS FROM VISCOSE MANUFACTURE,
O. P. Sinev.
Translated from Khimicheskie Volokny, No 2, 42-44 (Mar-April) 1969. Fibre Chemistry, No 2, Mar-April 180-183, 1969. 15 ref, 2 fig, 1 tab.

Descriptors: *Chemical precipitation, Alkalinity, Limes, Waste water treatment, Waste treatment, *Decomposing organic matter, Cellulose, Water purification.
Identifiers: *Viscose rayon, *Viscose plant wastes, *Cellulose xanthate, Hydrocellulose, Zinc compounds.

In considering the problem of purification of waste waters from the manufacture of viscose rayon, the sequence of decomposition of cellulose xanthate and precipitation of the resulting hydrocellulose must be separately considered. The former can be calculated from the known chemical composition of the cellulose xanthate, especially zinc content, and the temperature and pH of the precipitating bath. The rate of precipitation of suspended hydrocellulose is retarded by the formation of gas bubbles on the particles and this can be counteracted by agitation. When the solution is made alkaline with lime, considerably more rapid coagulation and precipitation takes place. (Work - North Carolina State University)
W71-07012

TEXTILE EFFLUENT TREATMENT WITH FLUE GASES,
Shaw and Marvin Ltd., London (England).
J. S. Franklin, K. Barnes, and A. H. Little.
International Dyer, Vol 142, No 6, 427-432, 1969.

Descriptors: Alkalinity, Waste Water Treatment, Effluents, Textiles, Waste treatment, Hydrogen ion concentration, *Sewage treatment
Identifiers: *Dyehouse wastes, *Mercerizing, Sodium hydroxide, Stack gases, *Textile mill wastes, Sulfuric acid, Caustics.

The effluent waste waters from dyeing operations can be handled satisfactorily by a local sewage treatment plant but the strongly alkaline waste water from the mercerizing operation requires neutralization. About 80 tons of sulfuric acid had been used in other operations and this reacts with the 350 tons of sodium hydroxide in 60 million gallons per year, but this was inadequate. To overcome the difficulty, after a period of experimentation, an absorption tower was built in conjunction with an oil fired boiler. The stack gases from this bubble through a packed column counter to the downward flow of spent mercerizing solution. The resulting waste water had a pH of 8.8 and the operating cost was estimated to be about 12 shillings per 1,000 gallons of effluent treated. (Work-North Carolina State University)
W71-07030

SILICATE TREATMENT FOR ACID MAIN DRAINAGE PREVENTION, SILICATE AND ALUMINA/SILICA GEL TREATMENT OF COAL REFUSE FOR THE PREVENTION OF ACID MINE DRAINAGE.
Tyco Labs., Inc., Waltham, Mass.

Copy available from GPO Sup Doc as EP 2.10:14010DLI 02/71, $1.00; microfiche from Na-

tional Technical Information Service as PB-198 427, $0.95. EPA-WQO Report 14010DLI, February 1971. 94 p, 17 fig, 31 tab, 10 ref, 3 append. EPA-WQO Contract No: 14-12-560.

Descriptors: Waste water treatment, *Silica, *Gels, Mine drainage, Water pollution control, Weathering, Neutralization, *Acid mien water.
Identifiers: *Coal refuse, *Alumina/silica gel, Waterglass.

A treatment technique has been demonstrated on a laboratory scale which inhibits or prevents the generation of acid mine water from waste coal refuse. Three variations of the general method were considered: (1) Neutralization of the water-accessible refuse with a dilute solution of sodium silicate (waterglass), (2) Development of a continuous gel on the refuse surface structure which sealed off the entire pile from natural runoff waters, (3) Development within the pile structure of a continuous silica/aluminia gel to eliminate percolation through the refuse and minimize the effect of natural erosion of the gel structure. Comparison of the effluent water with an untreated pile shows that the neutralized pile was effective for a minimum of 120 in. of equivalent rainfall in inhibiting AMD generation. The surface gel was effective for a longer period of time. The most effective treatment utilized a mixed alumina/silica gel formed within the pile at depths up to 6 in. This method was effective for more than 500 in. of equivalent rainfall, the duration of the test, and appeared to be exceptionally stable at that time. The weathering resistance of the treatment methods was evaluated by heating the gel treated refuse in the laboratory and exposing it to rain, snow, and freeze-thaw cycles outdoors. Extensive washings of the weathered test materials established the fact that the treatments were effective for at least 120 in. of equivalent rainfall (the duration of the test) in preventing AMD generation.
W71-07052

SECONDARY TREATMENT OF HOG WASTE IN AN ANAEROBIC STABILIZATION POND,
North Dakota Water Resources Research Inst., Fargo.
Robert G. Butler.
Available from National Technical Information Service as PB-198 429, $3.00 in paper copy, $0.95 in microfiche. North Dakota Water Resources Research Institute Report WI-221-011-69, December, 1969. 35 p, 4 fig, 11 tab, 44 ref. OWRR Project A-010-NDAK (1).

Descriptors: *Anaerobic conditions, Biochemical oxygen demand, *Oxidation lagoons, Farm wastes, *Bacteria, Waste water treatment, *Anaerobic bacteria, Photosynthetic bacteria, Microorganisms, Chemical analysis.
Identifiers: *Hog wastes.

This study relates the physical and chemical characteristics of the contents of an anaerobic stabilization lagoon to the bacteria that are responsible for the stabilization of the waste. The lagoon is fed by effluent from a settling tank that receives wastes from a hog barn. The lagoon operated as an unheated digester and maintained a pH between 7.2 and 8.1. The Redox potential varied from -370 to -403 millivolts. The mean concentration of volatile acids was 403 mg/l. The average level of BOD for the lagoon water was 566 mg/l. A BOD loading of 3,250 pounds per acre per day did not produce lagoon failure. Sulfate reducers were grown on Postgate's Media E. Methane producing organisms were detected. Photosynthetic organisms were grown on two different media.
W71-07055

5E. Ultimate Disposal of Wastes

ENVIRONMENTAL QUESTIONS THAT NOBODY LIKES TO HEAR.
For primary bibliographic entry see Field 05G.
W71-06627

MEMORANDUM OF EVIDENCE TO THE MINISTRY OF HOUSING AND LOCAL GOVERNMENT WORKING PARTY ON SEWAGE DISPOSAL.
Committee from the Inst. of Water Pollution Control.

Water Pollution Control, Vol 68, No 6, p 603-609, 1969.

Descriptors: *Water pollution control, *Sewage disposal, *Deterioration, *Sewage treatment, *Treatment facilities, Planning, Storm runoff.
Identifiers: *Separate system, Storm sewage, Great Britain.

The Institute of Water Pollution Control gives evidence on and makes suggestions relating to sewage disposal for a Memorandum to the 'Jeger' Working Party. Topics discussed are divided into five categories: (1) public health, (2) amenity, (3) economic effects, (4) sewage treatment and disposal processes, and (5) administration and standards. Under the section on amenity, the Institute notes that with regard to the amenities of rivers, the major cause of deterioration is the generally inadequate provision for sewage disposal integral with residential and industrial expansion. Even where adequate sewage treatment facilities exist, storm-sewage discharges often impair river amenities. Separate sewer construction is recommended. Methods of sewage treatment are discussed such as: sewage sludge utilization after heated digestion, plus quaternary processes for denitrification, de-salination, and phosphate removal. Other topics covered are: trade effluent control, planning authorities, coastal pollution, settling tank design, and suggestions for investigational research.
W71-06636

GEOLOGIC AND HYDROLOGIC FACTORS BEARING ON SUBSURFACE STORAGE OF LIQUID WASTES IN MARYLAND,
Geological Survey, Parkville, Md.
Edmond G. Otton.
Report available from Maryland Geological Survey, Latrobe Hall, Johns Hopkins University, Baltimore, Md. 21218, $2.75. Maryland Geological Survey Report of Investigations No 14, 1970. 39 p, 10 fig, 6 tab, 57 ref.

Descriptors: *Waste disposal, *Liquid wastes, *Waste storage, *Injection wells, *Maryland, Subsurface investigations, Geology, Hydrogeology, Aquifer characteristics, Water quality, Hydrologic properties, Evaluation, Planning.
Identifiers: *Subsurface liquid-waste storage, *Waste injection wells.

Maryland is divided into 3 major regions and these, in turn are divided into 8 major subregions on the basis of physiography, geology, and hydrology and each is discussed in relation to deep-well injection of wastes. In the Appalachian Region, there are several porous zones that might accept injected wastes, and thick sequences of low-permeability rocks might function as confining layers. In some places there are fresh-water zones that must be considered and in the eastern part of the Western Maryland subregion, there is extensive faulting that might permit vertical leakage of injected wastes. In the Piedmont Region the highly metamorphosed and fractured rocks of the Catoctin Mountain belt offer few opportunities for practicable injection of wastes because of the low permeability and generally ineffective confining layers. In the Coastal Plain Region factors related to waste injection decisions range widely. Most of the aquifers contain fresh water in the Inner Coastal Plain and the number decreases seaward. In the Middle Coastal Plain, there appear to be several saline aquifers below a depth of about 2,000 feet and in the Outer Coastal Plain there are many. Throughout the Coastal Plain Region there are extensive thick confining layers. (Woodard-USGS)
W71-06695

WASTE DISPOSAL--WATER TREATMENT PLANTS (JOINT DISCUSSION).

J Am Water Works Assoc, Vol 58, No 9, p 1102-1116, Sep 1966.

Descriptors: *Waste water treatment, *Waste disposal, *Sludge disposal, *Application methods.
Identifiers: *Detroit, Michigan, Back-wash water.

In a joint discussion at the annual conference of the AWWA in May 1966 several speakers discussed various aspects of the problem of disposing of wastes from water treatment plants without causing pollution. Local factors were taken into account when deciding whether or not such wastes were likely to have an adverse effect on the receiving water. The effects of Pennsylvania state water quality standards and of federal pollution-control legislation on the disposal of wastes from water works were considered, and the methods of disposal at Detroit, Michigan, were described by G.J. Remus. One of the Detroit works is situated on the banks of the Detroit river and the filter wash-water from this plant is discharged directly to the river; since the flow is rapid, the wash-water is dispersed rapidly and there is no evidence of sludge deposits. The wash-water is chlorinated before discharge and is bacteriologically of better quality than the river water. The other three water works are situated away from the river; at the largest of these the filter back-wash water is recirculated for reuse, while at the other two it is discharged to a sanitary sewer, and settled before discharge to a storm sewer, respectively. The sludges from the sedimentation tanks at all the plants are discharged to the sanitary sewers.
W71-06846

10,000 FT LONG SEA OUTFALL AT HASTINGS IN SUSSEX.

Civil Eng Public Works Rev, Vol 63, No 746, p 1003, Sep 1968.

Descriptors: *Outlets, *Pumping plants, Pollution abatement, Pretreatment (Water), Construction, Sewage disposal, Waste disposal.
Identifiers: *Great Britain, Stormwater sump.

A new sewage disposal scheme is under construction to eliminate seashore pollution caused by direct discharges to the ocean through two conventional outfalls. The plan involves pretreatment of sewage after which it is pumped through a long outfall pipe to a point two miles offshore. The pumping station will handle sewage flows up to 6 dwf or 7.5 mgd, and a combination storm weir and automatic penstock will pass excesses to the stormwater pump. A culvert will connect the stormwater sump to the foreshore, and for sea-levels below mid-tide the stormwater will discharge to the sea by gravity. At other times when the culvert is tide-locked, a stormwater pump will operate. Descriptions of physical characteristics, workings, and methods of construction of the long sea outfall and the pumping station are included along with a diagram of the new sewerage scheme.
W71-06848

LOWESTOFT CHOOSES TUNNEL FOR SEWAGE OUTFALL.
For primary bibliographic entry see Field 08A.
W71-06854

TIVERTON SEWAGE WORKS RECOGNIZES FLOOD HAZARD.
For primary bibliographic entry see Field 05D.
W71-06855

LAUNCHING A TWO MILE SEWAGE OUTFALL.

Surveyor, Vol 82, No 3978, p 16-17, Aug 30, 1968. 4 fig.

Descriptors: *Drainage systems, *Treatment facilities, Outlets, Water pollution sources, Construction, Pumping plants, Weirs, Storm runoff, Flow control, Costs, Design data, Waste disposal.
Identifiers: *Great Britain.

The Hastings western area main drainage scheme includes a sewerage outfall, two new pumping stations, a partial treatment works, and a pumping main. The scheme was designed to replace two conventional outfalls which caused pollution of the foreshore and shallow water because of insufficient length. The new outfall was built up into seven strings in a special assembly area, and these sections were joined successively before the entire pipe was launched into its final position on the sea bed. Further construction procedures are explained along with the means used to determine the proper length of the outfall. The new pumping station pumps sea sewage flows up to 6 d.w.f., and a discharge to a stormwater sump. The sump connects to the foreshore by a culvert and for sea levels below mid-tide, stormwater discharges to sea by gravity. At times when the culvert is tide-locked, a stormwater pump operates. Costs, dimensions, and other details of the entire scheme are included in the article.
W71-06859

HYDROGEOLOGIC STUDIES ARE KEY TO SAFETY IN WASTE MANAGEMENT PROGRAMS,
Robert E. Bergstrom.
Water Sewage Works, Vol 116, No 4, p 149-155, Apr 1969. 7 fig, 7 ref.

Descriptors: *Groundwater, *Waste disposal, *Water pollution, *Illinois, *Treatment facilities, *Tunnels, Flow control, Aquifers, Data collections, *Hydrogeology, Waste water treatment.
Identifiers: *Disposal operations, *Storm tunnels, *Waste management, Deep tunnel plan, Chicago.

Waste disposal is explored as a possible factor in groundwater contamination. State-reviewed disposal operations in Illinois that are specifically discussed include: landfills and dumps, radioactive waste burial grounds, sewage treatment and waste storage ponds, disposal wells, and sewage-stormwater tunnels. The Chicago Sanitary District's tunnel plan for the prevention of stormwater and raw sewage bypassing treatment plants and polluting streams is described. Initial reports concluded that stormwater and sewage would not pollute the groundwater reservoir because the rock in which the tunnel was bored is tight, and head relations provide that water only moves into and not out of the tunnel. Possible problems created by this project are mentioned. The following suggestions are proposed to aid groundwater practitioners in waste management: (1) the selection of sites for waste disposal based on hydrogeologic conditions which indicate natural safeguards and the protection of health and resources; (2) procurement of data needed to develop criteria for determining geologic conditions and beneficial engineering practices; and (3) the study of investigations relating to waste management topics such as saturation and water movement in typical geologic terrains that might be used for waste disposal.
W71-06872

SUBMARINE PIPELINE TO DISCHARGE TREATED EFFLUENT AT SPILSBY RDC,
For primary bibliographic entry see Field 05D.
W71-06877

THE WATER-SEWAGE CYCLE,
For primary bibliographic entry see Field 05G.
W71-06880

KAPPALA UNDERGROUND SEWAGE WORKS, STOCKHOLM,
For primary bibliographic entry see Field 05D.
W71-06885

HYDRAULIC FRACTURING,
For primary bibliographic entry see Field 08B.
W71-06950

DEEP TUNNEL STORAGE MAY SOLVE CITY STORM WATER PROBLEM.
For primary bibliographic entry see Field 05G.
W71-06981

LABORATORY STUDY OF THE BEHAVIOR OF A SANITARY LANDFILL,
Drexel Univ., Philadelphia, Pa.
For primary bibliographic entry see Field 05B.
W71-07011

5F. Water Treatment and Quality Alteration

ELECTRODIALYSIS WATER TREATMENT,
Strategic Air Command, Offutt AFB, Nebr.
Wilbur B. Ruebsamen.
The Military Engineer, Vol 63, No 411, p 34-36, January-February, 1971. 3 p, 6 fig, 2 tab.

Descriptors: *Water treatment, *Water supply, *Groundwater, *Electrodialysis, *North Dakota, Military reservations, Reverse osmosis, Methodology, Evaluation, Salinity, Costs.

Two methods of treatment of groundwater supply at Grand Forks Air Force Base, N.D. are described and evaluated. Electrodialysis is a process using electrodes and semipermeable membranes that permit the passage of either cations or anions. Reverse osmosis is a process using high pressure and a semipermeable membrane. The decision of which unit to use was based on its production performance. The test and failure data show the electrodialysis unit to be superior in performance and reliability. Through use of the electrodialysis water treatment system, the money saved from the maintenance of the old distillation process has paid for the purchase, installation, and operational cost. It is highly reliable, aids in extending the life of other water-using equipment, and is easy to operate and maintain. (Woodard-USGS)
W71-06660

ENVIRONMENTAL HEALTH AND COMMUNITY PLANNING,
J. A. Salvato, Jr.
J Urban Planning Devel Div, Am Soc Civil Engrs, Vol 94, No UPI, p 23-30, Aug 1968.

Descriptors: *Planning, *Environmental effects, Public health, Urbanization.

Effects are given of a type of planning which includes land use, water system and transportation, and prevention of problems caused. The health department responsibility for the issuance of permits and approval of operational results to protect public health is emphasized.
W71-06754

ANALYTICAL PROCEDURES FOR MEASURING CHEMICALS IN THE PUBLIC HEALTH SERVICE DRINKING WATER STANDARDS, 1962,
Norman A. Clarke, and John D. Weeks.
J Amer Water Works Assoc, Vol 62, No 3, p 172-176, Mar 1970.

Descriptors: *Standards, *Potable water, *Analytical techniques, *Measurement, *Chemical analysis, Pollutant identification.

A list is compiled of chemical substances in the Drinking Water Standards, and recommended methods of analysis and sensitivity of techniques for measuring these chemicals are defined. Also included are the methods of atomic absorption and spark emission spectroscopy, where applicable.
W71-06765

ARCTIC ENVIRONMENTAL TEST OF WATER HANDLING, WATER STORAGE, AND WATER PURIFICATION EQUIPMENT.
Army Test and Evaluation Command, Aberdeen Proving Ground, Md.

Available from NTIS as AD-867 022, $3.00 in paper copy, $0.95 in microfiche. Report MTP 8-4-014, Nov 1969. 10 p, 8 ref.
Identifiers: *Water supplies, Test methods, Arctic regions, Handling, Storage, Army research, Transportation, Acceptability, Safety, *Water storage, *Water treatment.

The environmental test procedure describes test methods and techniques for evaluating the performance and characteristics of water handling, water storage, and water purification equipment under arctic winter conditions.
W71-06793

WATER AND SEWERAGE FACILITIES PLANNING PROGRAM FOR MADISON, ST. CLAIR AND MONROE COUNTIES, ILLINOIS. PHASE I-PROGRAM DESIGN.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 06B.
W71-06794

HEALTH PROBLEMS,
Wisconsin Univ., Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 05G.
W71-06813

PROBLEMS OF WATER TREATMENT IN DEVELOPING COUNTRIES,
For primary bibliographic entry see Field 05D.
W71-06867

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Department of Health, Education, and Welfare, Washington, D.C.; and Public Health Service, Washington, D.C.

Public Health Service Publication No 24 (1963 Revision). Washington, DC, US Government Printing Office, 1963. 121 p.

Descriptors: *Water quality control, Surface water, Groundwater, Water supply, *Water wells, Drilling, Pumps, Water treatment, Water conditioning.
Identifiers: *Sanitary protection of wells, *Water well construction, Bacteriological quality, Emergency disinfection, Suggested ordinance, Contamination sources.

Developed in cooperation with the Joint Committee on Rural Sanitation, this manual reflects the changing trends in the problems of individual water supply systems and includes additional and new information in this field which has come to the attention of the Public Health Service. While establishing uniform practice among various Federal Agencies concerned with the sanitation aspects of individual water supplies, the manual would also be of use to state and local health authorities, well-drillers, industry groups, and others concerned with the development and operation of such supplies. It emphasizes the sanitation aspects of small supply systems such as those servicing individual dwellings, farms, rural schools or similar institutions, recreational or tourist accommodations, camps, or other installations not having access to public water supply systems. The recommended practices should be helpful in the design, construction and operation of these types of private and quasi-public systems. (Campbell-NWWA)
W71-06959

5G. Water Quality Control

AN OIL DISPERSANT'S EFFECT ON THE MICROFLORA OF BEACH SAND,
Washington Univ., Seattle, Wash. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W71-06491

LEGAL ASPECTS OF WATER SUPPLY AND WATER QUALITY STORAGE,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
William R. Walker, and William E. Cox.
Bulletin No 37, Water Resources Research Center, Virginia Polytechnic Institute, Blacksburg, Va, August 1970. 235 p, 19 map, 514 ref, 6 append.

Descriptors: *Watershed Protect and Flood Prev Act, *Federal Power Act, *Water supply, *Water storage, Prior appropriation, Riparian rights, Riparian waters, Reasonable use, Relative rights, Administrative agencies, State governments, Beneficial use, Civil law, Municipal water, Federal government, United States, Legislation, Water quality, Water quality control, Water resources development, Cities, Water pollution, Consumptive use, Waste dilution.

The two main objectives of this work are: (1) to investigate the enabling legislation for federal water supply storage and the consequences of storage in federal reservoirs, and (2) to explore the impact of state water law upon federal legislation. There are four federal acts discussed: (1) the Water Supply Act of 1958; (2) the Watershed Protection and Flood Prevention Act; (3) the Federal Water Power Act; and (4) the Flood Control Act of 1944. The functions of the Bureau of Reclamation and the Army Corps of Engineers are discussed in connection with the Water Supply Act. The riparian water right is examined vis-a-vis the appropriative water right. This effort includes analysis of: (1) waters subject to each right, (2) municipal water rights, (3) the right to store water under each doctrine, (4) water supply storage, and (5) the reasonable and beneficial use concepts. The authors also explore the enabling legislation for federal water quality storage, including the 1961 amendment to the Federal Water Pollution Control Act, and storage by federal agencies. The final topic examined is the impact of state water laws on the effectiveness of water quality storage legislation. (See also W71-00480) (Hart-Florida)
W71-06506

RACE TO PLUG BURST MAIN BEFORE RAINS CAME.
For primary bibliographic entry see Field 08B.
W71-06543

DROP INLET REPAIRS STORMS DAMAGE TO SEWER SYSTEM.
Eng Contract Record, Vol 82, No 2, p 26, Feb 1969.

Descriptors: *Damages, *Repairing, *Intakes, Construction materials, *Sewers, *Construction equipment.
Identifiers: *Storm sewers, *Medary, Wisconsin.

In Medary, Wisconsin, a storm sewer, washed out by heavy rainfall, was repaired in twelve days. The Wisconsin Culvert Co. recommended that the now exposed area, which had previously held a 750 foot-long piece of a 72 inch diameter storm sewer pipe, be contained by fabricating a 96 inch diameter drop inlet constructed of 8-gage corrugated galvanized steel, closely riveted and caulked. The drop inlet would connect to the existing 72 inch line by means of a watertight 84 inch diameter, 8-gage galvanized steel pipe, close riveted and caulked, outlet connected at the base of the drop inlet would run 400 feet along the gouged ditch line. The method was approved and immediate fabrication of sections of the drop inlet began followed by trucking of these sections to the site and their installation.
W71-06544

WISCONSIN SANITARY SEWER WON BY 2.3%.

Eng News-Record, Vol 182, No 14, p 43, Apr 3, 1969. 1 tab.

Descriptors: *Costs, *Bids, Construction materials, Drainage systems.
Identifiers: *Storm sewers, West Allis, Wisconsin.

Unit prices and quantities of materials proposed for a 3-branch storm sewer contract in West Allis, Wisconsin are tabulated and discussed for the two lowest bidders for each branch. Branch A includes three reinforced concrete storm tunnels and a corrugated metal culvert arch. Branch B and C will relieve severe flooding conditions in this area of Wisconsin.
W71-06545

CHICAGO SEWER DRAIN PROJECT.

Eng News-Record, Vol 182, No 10, p 41, Mar 6, 1969. 1 tab.

Descriptors: *Contracts, Drainage systems, Flood control, Concrete construction, Cost comparisons.
Identifiers: *Chicago, *Sewer relieving.

Detailed statistics are given concerning bids for a contract to construct sewer drains extending the sewer system in a section of Chicago. Consolidated Construction Co., Inc. won this contract, and it will undertake the project to provide flood relief from a storm of five frequency or less. Inadequate smaller sewers will be replaced, and a number of trunk sewers and siphons will be relieved. The project will be constructed in open cut, and reinforced concrete will be the principal material used. Prices from the two lowest bidders are tabulated for each of the items to be included in the project.
W71-06546

MICHIGAN SEWER AND ROAD JOB.

Eng News-Record, Vol 182, No 9, p 43, Feb 27, 1969. 1 tab.

Descriptors: *Bids, Construction materials, Concrete pipes, Backfill.
Identifiers: *Port Huron, Michigan, *Storm sewers.

Unit prices and quantities of materials proposed for a Port Huron, Michigan paving, storm sewer, and water main contract are tabulated and described for the two lowest bidders. Reinforced concrete will be used for storm sewer piping. The contractor will excavate and backfill over existing sewers because of the formerly poor backfill.
W71-06547

STORM SEWER CHANNEL IN NEBRASKA.

Eng News-Record, Vol 181, No 2, p 69, Jul 11, 1968. 1 tab.

Descriptors: *Construction costs, *Bids, Concrete pipes.
Identifiers: *Omaha, Nebraska, *Storm sewers.

Bids for constructing a channel section of a storm sewer in Omaha are compared, and prices for quantities of materials are tabulated for the two lowest bidders. A long riprapped, flat-bottom ditch will be filled with reinforced concrete piping. The proposed length of the channel was shortened due to difficulties in obtaining easements. The project will improve alignment and flow capacity to prevent property damage by erosion.
W71-06548

ADDITIONAL INFORMATION-FAILURE OF STORM SEWER SYSTEM.

Water Sewage Works, Vol 117, No 6, p 191, Jun 1970.

Descriptors: *Sewers, *Decision making, Overflow, Wisconsin.
Identifiers: *Storm sewers, *Medary (Wisc).

A description of the storm sewer system situation in Medary, Wisconsin prior to the overflow in June 1968 is given. The article states that the failure of the sewer line in Medary was not due to the design of the storm sewer system, the installation of the pipe, or the type of pipe used. Two reasons are given as to the cause of the overflow: modifications to the storm sewer without informing the consultant engineer; and, lack of knowledge or consideration of hydraulic principles.
W71-06549

RX FOR . . . .

Water Sewage Works, Vol 116, No 12, p 464-465, Dec 1969.

Descriptors: *Construction materials, *Sewers, Storm runoff, Steel, Wisconsin.
Identifiers: *Storm sewers, *Medary (Wisc).

Failure of a concrete storm sewer system in Medary, Wisconsin during a heavy rainfall resulted in property damage and threatened disaster for two major arterial highways. With weather forecasts predicting more storms, officials ordered the construction and installation of a large corrugated, galvanized steel storm sewer. Dimensions and details are given of the system which was installed and operating in 12 days--an unlikely feat to perform using other conduit materials.
W71-06550

SEWERAGE.
British Standards Inst., London (England).
For primary bibliographic entry see Field 08B.
W71-06552

MODEL STUDIES OF STORM SEWER DROP SHAFTS,
For primary bibliographic entry see Field 08B.
W71-06553

UNDERWATER INSPECTION--SEEING IS REVEALING,
Tom Davey.
Water Pollution Control, Vol 107, No 11, p 16-17 and 31, Nov 1969.

Descriptors: *Outlets, *Storm runoff, Sewage effluents.
Identifiers: *Storm sewers, Toronto.

On one underwater diving job, two consulting engineers inspected storm water outfalls near the lakeshore in Toronto. They were lowered into manholes, and inside they found accumulations of silt and domestic and industrial sewage debris even though these wer storm sewers. As a result of these obstructions, storm flow had become more restricted over the years.
W71-06555

URBAN RENEWAL IN WHITE PLAINS, NEW YORK,
For primary bibliographic entry see Field 08A.
W71-06556

POLLUTION ABATEMENT THROUGH SEWER SYSTEM CONTROL,
For primary bibliographic entry see Field 05D.
W71-06557

SOME ASPECTS OF DEEP SEWER MAINTENANCE,
For primary bibliographic entry see Field 08B.
W71-06558

ORGANIZING AND PLANNING FOR SEWER MAINTENANCE,
For primary bibliographic entry see Field 08C.
W71-06559

STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
For primary bibliographic entry see Field 08B.
W71-06560

RATIONAL 'RATIONAL' METHOD OF STORM DRAINAGE DESIGN,
For primary bibliographic entry see Field 08B.
W71-06561

DUNFERMLINE PAST, PRESENT AND FUTURE,
William G. Stephenson.
J Inst Munic Engrs, Vol 96, p 53-60, Feb 1969.

Descriptors: *City planning, Drainage programs.
Identifiers: *Dunfermline, Scotland, *Storm sewers, Combined sewers.

The highways, drainage works, water supply, and lighting of Dunfermline are discussed. The overloading of combined sewers since the last war has necessitated extension of storm relief sewers. Two projects will begin to ameliorate the situation. Meanwhile, all new drainage projects have been laid on the separation system.
W71-06562

OHIO STORMS BURST TWO RESERVOIRS.

Eng News-Record, Vol 183, No 3, p 13, Jul 17, 1969.

Descriptors: *Ohio, *Damages, Storm runoff, Storm drains.
Identifiers: *Storm overflows, Storm sewage.

Severe storms in northern Ohio caused serious damage to 23 counties in the state. In four sections of Bellevue, the heavy rains raised the water table so high that sewage-filled water rose out from the limestone channels of the underground storm drainage system. Residents spent days pumping water off to ditches draining Lake Erie. The flooding also destroyed much of Bellevue's $4.5-million sewage interceptor and treatment plant in addition to damaging reservoirs, bridges, etc. in other Ohio areas.
W71-06563

OHIO RIVER VALLEY WATER SANITATION COMMISSION: SEVENTEENTH, EIGHTEENTH, NINETEENTH, AND TWENTIETH YEARBOOKS.

28 p, 1965; 44 p, 1966; 40 p, 1967; 44 p, 1968.

Descriptors: *Water quality, *Control structures, *Ohio River, *Water management (Applied), Monitoring, Geological surveys, Hydroelectric plants.
Identifiers: *Water quality criteria, Hydrological surveys.

Progress in cooperative work on the management of water quality in the Ohio River valley is reviewed. The 18th yearbook contains the criteria which have been recommended for water quality. Since the Water Quality Act of 1965 required the establishment of water quality standards for the individual states, a major problem is the reconciliation of standards, especially where different standards are applied to the same stretch of river bordering two states. Other projects include: expansion of the system for monitoring water quality, appraising river conditions, and forecasting impending changes some days in advance; development of automated forecasting procedures for management of water quality using a mathematical model; geological and hydrological surveys to determine the potentialities and limitations of deep wells for the disposal of difficult or toxic waste waters; assessment of changes in aquatic life; and, investigations on the enrichment of oxygen in rivers by various methods of operation at hydroelectric power facilities. Each yearbook includes data on the individual water quality characteristics in the Ohio River and its tributaries, and on the present status of municipal and industrial pollution control facilities. The 20th yearbook also contains an article by R. H. Leach, reviewing the accomplishments of the Commission during the 20 years since its establishment.
W71-06564

SEWER MAINTENANCE IN A COLD CLIMATE,
F. E. Ayers.
Journal Water Pollution Control Federation, Vol 41, No 3, p 418-423, Mar 1969.

Descriptors: *Runoff, *Hydrology, *Water pollution sources, Storms, Infiltration.
Identifiers: *Sewer maintenance, *Canada, Combined sewers.

Sewer maintenance problems in Ottawa include threatened explosions due to improper sewer ventilation during snow and sleet storms, the entrance of granular street materials into catch basins and then the sewer systems, and the handling of excess runoff during spring thaws. The problem caused by the entrance of sand and peastone traction materials into the sewer system is greatest in the city's combined sewer district where pipes are older and laid on flatter grades than those of the newer separate system. Means of combating Ottawa's sewer maintenance problems are discussed. Two programs adopted are the crash maintenance program during spring to remove grit in flat sewers, thus allowing sewers maximum capacity for spring runoff; and the development of detained sewer maintenance records which are made available to crews handling sewer problems.
W71-06565

URBAN PLANNING ASPECTS OF WATER POLLUTION,
Sigurd Grava.
New York, Columbia University Press, 1969. 232 p.

Descriptors: *City planning, *Water quality control, *Urban renewal, *Urbanization, Water pollution control.

This study, strictly limited to water-borne wastes and water quality control, represents a synthesis of experience and thought on water pollution as it applies to urban planning and is intended as a guide and source of information for urban planners and community decision makers. Although non-technical in nature, the work includes data, financial and administrative considerations, and reference material.
W71-06567

DYNAMIC MODELING OF STREAM QUALITY BY INVARIANT IMBEDDING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. Stanley Lee, and Irving K. Hwang.
Water Resources Bulletin, Vol 7, No 1, p 102-114, February 1971. 13 p, 11 fig, 7 ref.

Descriptors: *Digital computers, *Mathematical modeling, *Dynamics, *Estimating equations, *Water quality, *Stream improvement, Pollution abatement, Biochemical oxygen demand, Dissolved oxygen, Least squares method.
Identifiers: *Invariant imbedding.

Recently developed estimation and nonlinear filtering techniques for the modeling of water quality were introduced. The invariant imbedding concept was used to obtain some useful estimator equations of dynamic stream pollution models. By using these equations, the parameters were estimated directly from differential equations representing the pollution model and from measured noisy data such as BOD and DO. A sequential estimation scheme was obtained whereby only current data were needed to estimate the current or future values of the unknown parameters. Consequently a large amount of computer time and computer memory could be saved and formed an effective on-line-up-dating scheme for the computer modeling and control. Not only the parameters but also concentrations of pollutants could be estimated and therefore formed an effective forecasting technique. The classical least squares criteria were employed to obtain optimal estimates. To illustrate the approach a simple representation of stream quality, proposed by Camp and Dobbins, was shown. The estimation problem was represented by two equations and was solved by the invariant imbedding estimator equations. First the differential equations were integrated by the Runge-Kutta integration scheme and then the results were corrupted with noise. A more general problem was also solved to illustrate the technique. Although a digital computer was used in this work, analog computers could also be used. (Kriss-Cornell)
W71-06587

HYDROLOGICAL AND ENVIRONMENTAL CONTROLS ON WATER MANAGEMENT IN AN ARID URBAN AREA,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 04C.
W71-06597

WATER AND RELATED LAND RESOURCES - STATE ADMINISTRATION, LEGISLATIVE PROCESS AND POLICIES IN MINNESOTA, 1970,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 06E.
W71-06599

ENVIRONMENTAL LAW HANDBOOK,
J. Brecher, and M. Nestle.
California Continuing Education of the Bar, Berkeley, Calif, 1970. 343 p, 2 fig, 1 dwg, 3 tab, 1 chart, 523 ref, 3 append.

Descriptors: *California, *Environmental sanitation, *Environment, *Water pollution control, Adjudication procedure, Ecology, Environmental effects, Environmental engineering, Highway effects, State governments, Federal government, Administrative agencies, Legislation, Legal aspects, Water pollution effects, Water pollution treatment, Water pollution sources, Water pollution, Highways.

Evaluated in this book are the following areas: (1) environmental quality; (2) reconstructing the environment; (3) the role of the lawyer in environmental improvement; (4) litigation; (5) administrative proceedings; (6) air pollution; (7) water pollution; (8) open space; (9) other environmental issues, including noise, highways, and hydroelectric power. The author discusses the causes of environmental deterioration, specific crisis areas, and long range deterioration. The following areas are considered with respect to the reconstruction of the environment: (1) the need for reform (2) economic measures, (3) new technology, (4) changes in regulatory authority, and (5) changes in business and industry. The role of the lawyer is examined in environmental advocacy, drafting legislation, and as governmental attorneys. Various procedures, causes of action, and the National Environmental Policy Act are considered with respect to environmental litigation. A discussion of administrative agencies, hearings, and judicial review

is included. The problems of air and water pollution, governmental regulation, and methods of control are evaluated. A chapter deals with preserving privately held open space and public lands. The study concludes with appendices presenting the texts of: (1) the National Environmental Policy Act; (2) interim guidelines for Federal agencies under the Act; (3) Michigan Act No. 127; and (4) a table of federal and state environmental statutes and regulations. (Robinson-Florida)
W71-06600

PUBLIC LAND POLICY AND THE ENVIRONMENT, VOLUME 3, PART II: ENVIRONMENTAL PROBLEMS ON THE PUBLIC LANDS. CASE STUDIES 9 THROUGH 17,
Rocky Mountain Center on Environment, Denver, Colo.
For primary bibliographic entry see Field 06E.
W71-06601

THE HUDSON RIVER BASIN.
For primary bibliographic entry see Field 06E.
W71-06602

PROTECTION AND ENHANCEMENT OF ENVIRONMENTAL QUALITY.
For primary bibliographic entry see Field 06E.
W71-06604

CASTING GARBAGE, ETC, INTO WATERS (CRIMINAL PENALTIES).
For primary bibliographic entry see Field 06E.
W71-06612

SANITARY DISTRICTS (CREATION, AUTHORITY, AND POWERS).
For primary bibliographic entry see Field 06E.
W71-06613

PUBLIC UTILITIES--ANTI-POLLUTION REQUIREMENTS.
For primary bibliographic entry see Field 06E.
W71-06614

WATER QUALITY STANDARDS (INTERSTATE WATERS OF IOWA).
For primary bibliographic entry see Field 06E.
W71-06616

CONSERVATION COMMISSIONS IN MASSACHUSETTS: WITH A SUPPLEMENTARY REPORT ON THE EMERGENCE OF CONSERVATION COMMISSIONS IN SIX OTHER NORTHEAST STATES,
Conservation Foundation, Wash., D.C.; and New England Conservation Services Center, Lincoln, Mass.
For primary bibliographic entry see Field 06E.
W71-06624

ARCTIC HEATED PIPE WATER AND WASTE WATER SYSTEMS,
J. W. Grainge.
Water Res, Vol 3, No 1, p 47-81, Jan 1969.

Descriptors: *Sanitary engineering, *Sewerage, Pipes.
Identifiers: *Canada.

Sanitation problems of communities in Northern Canada are discussed, and some environmental conditions are evaluated. Improvements in sanitation in small Canadian communities by providing piped water and sewage services have been proposed. Two original, relatively inexpensive, all-weather systems suitable where pipes may not be buried on account of soil conditions are described. Ideas and suggestions for planning water and sewerage systems are given.
W71-06625

ENVIRONMENTAL QUESTIONS THAT NOBODY LIKES TO HEAR.

Am City, Vol 85, No 3, p 8, Mar 1970.

Descriptors: *Water pollution, *Costs, Storm runoff, Overflow.
Identifiers: Storm sewers, Sewer separation.

This short review summarizes environmental problems in the United States such as water pollution, refuse collection and disposal, mineral depletion, and air pollution. Under water pollution, it is noted that $48 billion is required to separate sewers in the U.S. in order to correct effects of stormwater overflow. Grim predictions concerning the environment are made, and immediate action to improve conditions is advocated.
W71-06627

SAIGON'S SEWER NEEDS STUDIED.

Eng News-Record, Vol 183, No 5, p 16, Jul 31, 1969.

Descriptors: Investigations, *Water pollution sources, *Drainage systems, Storm runoff, Sewerage, Water pollution control, Sewers.
Identifiers: *Saigon River, Vietnam.

The Agency for International Development (AID) is conducting a 15-month, $800,000 study to discover the most efficient and economic sewer system for the disposal of Saigon's sewage and stormwater runoff. The present system is almost entirely non-functioning and as a result, the waterways of the city, including the Saigon River, are highly polluted with human waste and refuse. One plan to be explored is a drainage canal system for stormwater that would double as a transportation system. The results of the study will be used to support requests for financial assistance for reconstructing Saigon's sewers.
W71-06630

WATER POLLUTION -- COAST TO COAST.

Environ Sci Technol, Vol 3, No 9, p 804-805, Sep 1969.

Descriptors: *Municipal wastes, *Pollution abatement, Sewage disposal, Thermal pollution.
Identifiers: *Combined sewers, *Water pollution.

A report on the FWPCA's regional review notes includes: the municipal problem and the pollution abatement activities; industrial sources of water pollution abounding in the Northeast, Great Lakes, and Ohio regions; agricultural activities; the Northeast problem of combined sewer discharge with 90% of the United States population served by combined sewers located in this area; thermal pollution problems; and salinity. Statistics are given.
W71-06633

MEMORANDUM OF EVIDENCE TO THE MINISTRY OF HOUSING AND LOCAL GOVERNMENT WORKING PARTY ON SEWAGE DISPOSAL.
Committee from the Inst. of Water Pollution Control.
For primary bibliographic entry see Field 05E.
W71-06636

LAKE COUNTY ADOPTS CLEAN LAKE POLICY,
R. E. Anderson.
Water Sewage Works, Vol 115, No 11, p 412-415, Nov 1968.

Descriptors: *Sewage effluents, *Sewage treatment, *Water pollution control, Hydraulics.
Identifiers: *Lake County, Illinois, *Storm sewage, Capacity.

Effluents from sewage works of the North Shore Sanitary District, Lake County, Illinois, will be discharged into the Des Plaines river instead of into Lake Michigan, thus reducing pollution of the lake. Those works giving primary treatment only will be abandoned, and their services absorbed in expansion programs of other works. The capacity for storm sewage flows is to be increased, so that storm sewage will not enter the lake but will be pumped to works for treatment after the storm.
W71-06638

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS.
For primary bibliographic entry see Field 08A.
W71-06639

STATUS AND PROPOSED CONTROL OF POLLUTION IN BOSTON HARBOR AND ITS TRIBUTERIES,
John J. Flaherty.
J Boston Soc Civil Eng, Vol 55, No 4, p 221-230, Oct 1968.

Descriptors: *Pollution abatement, Sewerage, Discharge, Overflow, Storm runoff.
Identifiers: *Boston, Separate system, Deep tunnel plan, Combined sewers.

Stormwater overflows from combined sewerage systems and from industrial wastes is the principal cause of river pollution in the Boston area. About 100 outlets into the Harbor and its tributaries are affected by Boston storm overflows and combined sewer discharges from neighboring communities. Four principal alternative methods of pollution abatement for the area are: (1) complete separation of all sanitary sewerage and storm drainage systems, (2) construction of chlorination detention tanks, (3) construction of surface holding tanks, and (4) implementation of the deep tunnel plan. Engineers recommend the construction of sanitary sewers and storm conduits wherever existing principal design flows or runoff from 15-year frequency design rainstorms. The governmental agencies responsible for pollution control, as well as various studies and approaches to alleviation and abatement methods are listed. Results indicated that the most positive method of collecting and disposing overflows of mixed sewage and stormwater is the deep tunnel plan.
W71-06649

ON WATER POLLUTION CONTROL POLICY,
Thomas R. Camp.
Eng News-Record, Vol 181, No 7, p 22-23, Feb 12, 1970.

Descriptors: *Pollution abatement, *Regulation, Storm drains, Sewer separation.
Identifiers: *Construction grants, *Combined sewers, *Viewpoint.

The author criticizes the FWPCA's new policy of refusing construction grants for projects that provide less than 85% removal of five-day BOD, because this requirement does not cover the oxygen demand of ammonia (derived from human urine) or of combined sewer overflows. This policy would eliminate aid to most communities since many areas have combined sewer overflows. Big cities are cited as having the worst water pollution problems because they utilize storm drains as combined sewers, and street congestion hinders sewer separation. Chicago's alternate solution of underground deep rock storage tunnels for sewage is described and praised. The following recommendations are made towards achieving pollution abatement: (1) authorization for grants-in-aid to solve combined sewer problems; (2) mandatory heavy chlorination of sanitary sewage; (3) water pollution control authorities to manage watersheds; and (4) FWPCA's promotion of further legislation required to carry out the above aims.
W71-06653

COOLING WATER SOURCES FOR POWER GENERATION,
Westinghouse Electric Corp., East Pittsburgh, Pa. Power Systems Planning.
Louis G. Hauser.
ASCE Proceedings, Journal of the Power Division, Vol 97, No PO 1, Paper 7804, p 123-133, January 1971. 11 p, 9 fig, 6 tab.

Descriptors: *Water sources, *Cooling water, *Thermal powerplants, Thermal pollution, Systems analysis, Optimization, Electric power production, Nuclear powerplants.
Identifiers: Cooling water sources.

A forecast of thermal discharge growth by type of generation is derived from a forecast of electric generation, an estimate of generation mix, and the expected heat rates for each type of plant. Alternate methods of heat dissipation are explained and economically evaluated in terms of incremental cost additions to a base generation cost for once-through fresh water cooling. Generation cost increases are shown to be less than 5% for each type of cooling except for nonevaporative dry cooling. A survey of plant locations which includes a cost comparison of supplemental cooling at the load center versus power transmission from a once-through cooling water source indicates that approximately 70% of future generating stations will require supplemental cooling systems. Two cases of cooling tower cost optimization performed on a specific plant demonstrate how significant savings on a present worth basis can be obtained when more sophisticated analytical techniques are applied. (Knapp-USGS)
W71-06671

PROPOSED FEDERAL FUNDING FOR CONSTRUCTION OF COMMUNITY WATER AND SEWAGE FACILITIES.
For primary bibliographic entry see Field 06E.
W71-06689

BUILDING PLANS AS A BASIS FOR THE DESIGN OF WATER AND SEWAGE WORKS,
E. Hornig.
Gas Wasserfach (GAWFAN), Vol 107, p 32-36, 1966.

Descriptors: *Planning, *Hydraulic engineering, Water pollution sources.
Identifiers: *Germany.

The federal German building plan of 1960 can also be applied to hydraulic engineering. The number of future inhabitants per 103 sq. m. for town and country planning is calculated by statistical analyses and also represents an overall basis for the future requirements of water supplies and sewage treatment facilities. This plan takes into consideration the average rainfall and the pollution potential of the population.
W71-06745

A SIMULATION TECHNIQUE FOR ASSESSING STORM AND COMBINED SEWER SYSTEMS,
John A. Lager.
In: Combined Sewer Overflow Seminar Papers, Edison, NJ, Nov 4-5, 1969 Water Pollution Control Research Series, Report DAST-37, p 151-170, Mar 1970. 5 fig, 4 tab, 11 ref.

Descriptors: *Simulation analysis, *Assessments, *Computer programs, *Storm runoff, Water pollution control.

This paper describes work in progress to develop an assessment technique for comparing alternate solutions through a comprehensive computerized program capable of 'representing urban storm-water runoff phenomena, both quantity and quality, from the onset of precipitation on the basin, through collection, conveyance (both combined and separate systems), storage, and treatment systems to points downstream from outfalls which are significantly affected by storm discharges'. The program is intended for use by municipalities, government agencies, and consultants as a tool for evaluating the pollution potential of existing systems, present and future, and for comparing alternate courses of remedial action.
W71-06746

A PLAN FOR ENDING LAKE ERIE POLLUTION,
James C. Lamb.
Public Works, Vol 100, No 6, p 79-82, Jun 1969.

Descriptors: *Pollution abatement, Storm runoff, Sewage treatment, Separation techniques, *Lake Erie, Water quality.
Identifiers: Combined sewers.

Sources and effects of pollutants in Lake Erie are described along with plans and recommendations for the elimination of pollution from the lake. Urban runoff and combined sewer overflows are major sources of pollution contributing BOD, bacteria, and nutrients--especially phosphorus. Detroit, Cleveland, and Toledo are the largest offenders in the area of storm water runoff. Suggested state water quality programs are outlined in addition to areas requiring research and development such as: tertiary treatment, nutrient removal, sediment evaluation, pesticide pollution, radioactive and thermal pollution, industrial sludge disposal, oxygen deficient zones, and eutrophication. Expensive separate sewerage systems are recommended only where feasible, such as in redevelopment projects. However, where combined sewers exist, overflows should be disinfected before being discharged to a body of water, and future plans for storage and treatment should be made.
W71-06747

THE 1969 FLOODS,
John A. McCollum.
Calif Water Pollution Control Assoc 42nd Annual Conference, Apr 29-May 1, 1970, Sacramento, Calif.

Descriptors: *Damages, *Sewers, *Storm drains, *Repairing, California, Water pollution control.
Identifiers: *Los Angeles (Calif).

This paper describes the damage to the sewer and storm drain systems in the City of Los Angeles during and subsequent to the winter rains of January and February 1969. Emergency repair work, performed by forces of the Bureau of Sanitation of the Department of Public Works under adverse conditions, resulted in the protection of public and private property from costly damages. Steps taken to insure the health and sanitary condition of the citizenry included restoration of sewer lines, repair to channels and debris basins, and alleviation of slide potential. Damage was also experienced on a county-wide basis and a summary of events shows the interrelationships involved in emergency repair work performed.
W71-06749

ST. LOUIS FLOOD PROTECTION: INTERIOR DRAINAGE,
For primary bibliographic entry see Field 08B.
W71-06750

CONSERVATION PROGRAMS IN THE URBAN FRINGE,
For primary bibliographic entry see Field 04C.
W71-06751

UNDERFLOW SEWERS FOR CHICAGO,
Milton Pikarsky, and C. J. Keifer.
Civil Eng, Vol 37, No 5, p 62-65, May 1967. 2 diag, 2 tab.

Descriptors: *Design, *Sewers, *Overflow, *Planning, *Tunnels, Costs, Construction equipment, Computer models, Underflow, Water pollution control.
Identifiers: *Deep tunnel plan, *Chicago, Combined sewers.

Chicago is planning an underflow sewer system consisting of a large tunnel under rivers and canals into which all combined sewers will discharge. This system, costing $400 million dollars, will eliminate the need for a $4 billion dollar conventional separate sewer because spillages from combined sewers will be directed to the underground tunnel rather than polluting surface streams. The performance of the Lawrence Ave. underflow sewers was analyzed through a computer simulation of the system. Untreated overflow into local streams was reduced from 3%/year of the sewage from combined sewers to .8% from Lawrence Ave.'s underflow sewers.
W71-06752

SYSTEM DESIGN,
For primary bibliographic entry see Field 08B.
W71-06756

BRITAIN AND THE AMERICAN WATER QUALITY CRISIS,
Richard Wood.
Effluent Water Treat J, Vol 10, No 6, p 316-317, 319-321, Jun 1970.

Descriptors: *United States, *Cost analysis, *Comparative costs, Equipment, Standards, Pollution abatement, Water pollution control.
Identifiers: *Great Britain.

Britain's shortcomings with regard to water pollution control stem from a failure of financial investments in control plants to keep pace with the changing technology of industrial processes and their effects on both domestic and mixed-municipal sewage. A comparative cost analysis between Britain and the United States concerning water pollution control is discussed including: cost percents appropriated for equipment, industrial waste treatment, municipal sewage treatment, and river pollution abatement. Basic purification standards are included as well as effluent standards. The author expands on the idea that the exportation of pollution control equipment such as instrumentation and control systems to the United States is one area in which the British may contribute their technological advances in aiding both the United States and Britain.
W71-06757

MUNICIPALS WANT NEW CENTRAL BODY FOR WATER AND SEWAGE.

Surveyor, Vol 85, p 37 and 48, Apr 1970.

Descriptors: *Future planning (Projected), *Legal aspects, *Regulation, *Administration, Water pollution control.

The setting up of a central body, with much wider responsibilities than those of the present Water Resources Board, to plan, initiate, or coordinate action over the whole field of water resources and sewage purification and disposal, is proposed by the Institution of Municipal Engineers. The following points we discussed: the inadequacy of the present form of organization for the future; water supply and effluent disposal planning; standards research; and the delegation and determination in regards to responsibilities of river boards and local government bodies (i.e. surface water sewerage, positioning of surface water overflows and outfalls).
W71-06762

MERSEY RA STANDARDS FOR EFFLUENTS.
Surveyor, Vol 84, No 4039, p 98, Nov 7, 1969.

Descriptors: *Standards, *Sewage effluents, *Sewage disposal, Overflow, Water pollution control.
Identifiers: *Effluent standards, *Great Britain, Trade effluents, Storm sewage.

The Mersey and Weaver River Authority defined effluent standards in accordance with relevant local conditions. Standards were developed for the following areas: (1) purified sewage effluents discharged to inland rivers (normally applied to rates of flow up to 3 d.w.f.); (2) partially treated sewage effluents discharged to rivers (normally applied to rates of flow in excess of 3 d.w.f.); (3) untreated sewage effluents from storm sewage overflows; (4) sewage effluents discharged to tidal waters; and (5) trade effluents.
W71-06763

NEW AND PROPOSED LAWS,
Paul R. Bonderson.
Paper presented at the Calif Water Pollution Control Assoc, 42nd Conference, Sacramento, Calif, Apr 29 to May 1, 1970.

Descriptors: *Legislation, *Water quality control, *Water pollution control, *Legal aspects, *California, *Water quality act.

The Porter-Cologne Water Quality Control Act, a complete revision of the State's water quality laws, became effective January 1, 1970. The Act accomplishes the following objectives: (1) grants the State Board expanded powers to provide more leadership and greater influence over activities of regional boards; (2) requires regional boards to adopt more restrictive water quality control plans and discharge requirements so that better pollution control will be achieved; and, (3) makes major changes in enforcement procedures, including court assessment of $6,000 per day fines, which will give boards much more effective means for taking enforcement actions. Indications are that over 1,000 environmental quality control bills will be considered during the current legislative session. Consideration will be given to having a State sewage construction grant program. Major proposed water pollution control legislation will be summarized.
W71-06764

THE RESPONSIBILITY OF TREATMENT PLANT OPERATORS UNDER THE PORTER-COLOGNE WATER QUALITY CONTROL ACT,
Jerome B. Gilbert.
Paper presented at the Calif Water Pollution Control Assoc, 42nd Annual Conference, Sacramento, Calif, Apr 29 to May 1, 1970.

Descriptors: *Water quality act, *Water pollution control, Water quality control, *Regulation, *Administrative agencies.

The State Water Resources Control Board and the nine California Regional Water Quality Control Boards are the state agencies responsible for control of water pollution and water quality. The Porter-Cologne Water Quality Control Act greatly strengthens and expands powers and duties of these agencies. Although there are many factors contributing to the degradation of water quality, discharges from municipal and industrial waste treatment plants are still the principal cause of water quality problems. Under the new law, requirements will be made further restrictive resulting in highly sophisticated and more complicated treatment plants. Exacting performance by operators in charge of plants will be needed to prevent violation of requirements and to collect fines up to $6,000 per day. To help assure that qualified operators will be in charge, the State Board will classify all treatment plants and specify the level of competence necessary to operate them. The Board will also specify the training necessary to quality an operator for each level of competence. All operators should take advantage of training opportunities in order to qualify themselves for new levels of operating competence.
W71-06766

ESTABLISHMENT OF WATER QUALITY STANDARDS IN THE CITY OF TAKAMATSU,
Takishi Ishibashi.
Sangyo Kogai, Vol 6, No 6, p 372-382, Jun 25, 1970.

Descriptors: *Standards, *Water quality, *Systems analysis, *Investigations, *Water pollution treatment.
Identifiers: Japan.

An urban river system was employed to establish water quality standards in the Takamatsu area. Normally the standard is established by an investigation of the individual source of pollutants. In large cities where numerous sources exist, an exhaustive investigation is impractical; consequently, an average water quality standard, based on a sampling investigation of primary sources of pollutants, together with considerations of the special properties of the water area are taken as a basis in establishing the individual standard. This new system was effective in expediting the formulation of the standard. The general situation of the water area in question, status of water utilization, water pollution, results of investigations on water quality, pollutants' source, planning of the public sewage system, and future prospects of water pollution are presented. Basic factors considered in establishing and finalizing the water quality standard are given. Discussions made at committee meetings for establishing the standard are also included.
W71-06767

THE SEWERAGE (SCOTLAND) ACT 1968,
Dugald McDonald.
Surveyor, Vol 84, No 4036, p 46-48, and 51-53, Oct 17, 1969. 3 fig.

Descriptors: *Legislation, *Sewerage, *Sewerage disposal, *Sewers, *Prior appropriation, Jurisdiction, Local governments, Water pollution control, Industrial wastes.
Identifiers: *Trade effluents, *Scotland.

The Sewerage Scotland Act is described as a modern, comprehensive code governing sewerage, sewage disposal, and trade effluents. The act is divided into three parts: sewerage, trade effluents, and a supplemental part. The following subjects included in the act are discussed in the first part: local authority to provide sewerage, sewer maintenance, sewers vested in local authority, new sewer construction, sewer connections, joint sewerage and sewage disposal, highway drainage, septic tanks, adoption of private sewage works, defective drainage, abolition of special drainage districts, and prohibition on buildings erected on sewers. The part on trade effluents includes: the right to discharge to sewer, and existing and new discharges. The supplemental section reviews: the rights to sewage, powers of entry, sampling sewage, prohibition on harmful substances, application to the Crown, and settlement of appeals and disputes.
W71-06768

PORTER-COLOGNE ACT REVISITED,
Ronald B. Robie.
Paper presented at the Calif Water Pollution Control Association, 42nd Annual Conference, Sacramento, Calif, Apr 29 to May 1, 1970.

Descriptors: *Legislation, *California, Water quality control, *Water quality act, *Legal aspects, Water pollution control.

The Porter-Cologne Water Quality Control Act, effective January 1 this year, provides the State Water Resources Control Board and the nine California Regional Water Quality Control Boards with the 'tools' to implement and carry out an effective water quality control program. The new law is geared to enhance the water environment as well as to prevent water pollution. This is evidenced by the inclusion of esthetic enjoyment and the preservation of fish, wildlife and other aquatic preserves among the water uses to be protected. Other major provisions of the new law include: civil fines up to $6,000 per day for violation of cease and desist orders relative to a waste discharge; payment of a filing fee not exceeding $1,000 to accompany a report of a proposed or material change in a waste discharge; mandatory cleanup of pollution by a violator with full liability for cleanup costs; and integration of water quality into consideration of water rights, including appropriation of water by storage to be released in order to protect or enhance water quality.
W71-06769

UTILIZATION OF STREAM FOR STORM DRAINAGE,
D. A. Schneider.
Public Works, Vol 98, No 4, p 87, Apr 1967.

Descriptors: *Legislation, Drainage districts, *North Carolina, Water pollution control.

As the Court stated in a North Carolina case, municipalities can be held liable for damages caused by their failure to maintain proper sewer conditions including good drainage and freedom from obstruction. Thus, when a locality utilizes a natural waterway for sewerage and drainage, it is obligated to keep this water in proper condition, and it is liable under the law for damages resulting from neglect to perform this duty.
W71-06770

RIVER ENGINEERING AND WATER CONSERVATION WORKS,
Roland Berkeley Thorn.
Butterworths, London, 1966. 520 p.

Descriptors: *Water supply, *Water conservation, *Engineering education, Legislation.
Identifiers: *River engineering.

The editor collected articles by twenty-three authors, and these, together with his own contributions, form a comprehensive introduction to basic information needed by river authority engineers. The book also includes topics related to water supply engineering and the soil mechanics of flood embankments. With the exception of the first chapter on water conservation and water supply legislation, the emphasis is on engineering subjects and the means for solving major problems arising in river engineering and water conservation works.
W71-06771

THE USE OF BALANCING RESERVOIRS AND FLOW REGULATING RESERVOIRS IN DEALING WITH RUN-OFFS FROM URBAN AREAS,
G. Thompson.
In: River Conservation and Water Conservation Works, Butterworths, London, Chapter 9, p 132-141, 1966. 6 fig, 5 ref.

Descriptors: *Surface drainage, *Flow control, *Regulated flow, *River systems, *Design criteria, Sewers.
Identifiers: *Urban runoff, *Flow balancing.

This chapter attacks the problem of increased runoff from a river caused by urban development and the installation of surface water drainage. Such a problem ensues wherever more paved areas are directly connected by sewers to a river. As a solution, the author recommends flow balancing, which entails passing the flow through a natural or artificial lake with a restricted outflow, or flow regulation, in which part of the river flow is passed into specially-prepared areas. These plans can be economical, and they reduce peak flows and also channel sizes farther downstream. General design factors for implementing flow balancing and regulation are discussed; and then a scheme combining the two principles, which was applied to the River Cray, is described. Flow balancing is possible in new or undeveloped towns; whereas, it cannot

usually be implemented in a built-up area unless lakes or disused mine workings are available. In such urban areas, flow regulation is readily applicable. (See also W71-06771)
W71-06772

APPLIED FLOOD HYDROLOGY,
J. E. Nash.
In: River Engineering and Water Conservation Works, Butterworths, London, Chapter 6, p 63-110, 1966. 22 fig, 1 tab, 23 ref.

Descriptors: *Flood routing, *Rainfall, *Frequency analysis, *Discharge (Water), *Hydrograph analysis, *Unit hydrograph, Storm runoff, Rainfall-runoff relationships.

Two problems in flood hydrology are presented: (1) predicting peak discharges from rainfall data and such other factors as are found necessary; and (2) the determination of the frequency of exceedence of a discharge when records of discharge over several years exist or in the absence of such records. The chapter attempts to designate the tools available for solving such problems and the usefullness and limitations of these tools. Topics discussed under hydrograph analysis are: storm runoff from individual storms, rainfall and effective rainfall, the unit hydrograph hypothesis, changing the duration of a unit hydrograph, use of the S curve, calculation of unit hydrographs from rainfall and stream flow records, and uses of a unit hydrograph. The relation between the unit hydrograph and the catchment is explained, as is the volumetric relation between rainfall and runoff. The last two sections explore flood frequency and the relation of flood frequency to catchment characteristics. (See also W71-06771)
W71-06773

RUNOFF FROM COMBINED RURAL AND URBAN AREAS,
L. H. Watkins.
In: River Engineering and Water Conservation Works, Butterworths, London, Chapter 7, p 111-121, 1966. 5 fig, 4 tab, 4 ref.

Descriptors: *Hydrographs, *Hydrologic aspects, Rational formula, Rainfall.
Identifiers: *Urban runoff, *Great Britain.

Hydrologic principles of the calculation of runoff from rural areas are also applicable to urban and combined rural and urban catchments. However, traditionally urban runoff has been calculated by a variation of the basic method called the Rational Formula or the Lloyd-Davies formula. This formula has been shown to be reliable only for very small urban catchments, and it is being replaced by the R.R.L. Hydrograph method. This chapter discusses the R.R.L. Hydrograph method based on climatic conditions in Great Britain. In order for this method to be applied elsewhere, suitable rainfall data must be employed and adequate allowance made for increased impermeability of natural surfaces, particularly under conditions of tropical rainfall. (See also W71-06771)
W71-06774

STANDARDS FOR EFFLUENTS IN SWITZERLAND,
Eidgenoessisches Institut fuer Reaktorforschung, Wuerenlingen (Switzerland).
P. Courvoisier, and B. Mueller.
Available from NTIS as CONF-700 815, $3.00 in paper copy, $0.95 in microfiche. Presented at IAEA Symposium on Environmental Aspects of Nuclear Power Stations, New York, August 10-14, 1970, 700810-8. Paper IAEA-SM-146/14.

Descriptors: Legislation, *Industrial water, *Thermal pollution.
Identifiers: *Heated effluents, *Nuclear power plants, *Switzerland.

Maximum permissible levels for the release of effluents are stated by different laws, regulations or guide-lines in Switzerland. Policies followed are outlined. A recent addition of general interest is the recommendation of limits for thermal effects in surface waters. As the production of electric energy in Switzerland has been until very recently nearly exclusively by hydro-electric plants, the natural regime of the rivers has not been changed to any appreciable extent by their use as receivers of cooling water. It is possible to use the rivers for the direct cooling of a first group of nuclear power stations. However, the permissible limits for this use of river water had to be identified and fixed in the light of the goals for water protection stated by the Swiss law. A study has demonstrated the need to set up a careful planning for the disposal of heat into rivers.
W71-06792

ODOR CONTROL IN CATTLE FEED YARDS,
W. L. Faith.
Air Pollution Control Association Journal, Vol 14, 1964, p 459-460.

Descriptors: *Farm wastes, *Odor, *Mechanical control, Legal aspects, Spraying, Disposal.
Identifiers: *Feedlots, *Chemical control, Odor counteractants, Masking agents, Disinfectants, Potassium permanganate.

This paper deals with the experimental odor control program initiated in 1961 at the Roy F. Benton Feed Yards in Walnut, California, after complaints were received from a nearby residential area. A variety of methods to reduce odor to an acceptable level have been tried with varying results. A highly satisfactory procedure is based on 'good housekeeping' practices, frequent removal of fecal material, and abatement of residual odor by spraying the lots at designated intervals with a solution of potassium permanganate. Details of the method are discussed. (Christenbury-Iowa State)
W71-06803

ACCELERATION OF NATURAL DRYING OF POULTRY MANURE THROUGH MECHANICAL AGITATION,
California Univ., Davis.
James A. Moore, and Samuel A. Hart.
Unpublished paper. Presented Pacific Coast Region American Society of Agricultural Engineers, 1968. Paper No PC 68-121. 2 fig, 2 ref.

Descriptors: *Farm wastes, *Sublimation, Drying, Moisture content, Till, Winter, Freeze drying, Freezing, Equipment.
Identifiers: Relative humidity, Tiller drying, Natural drying.

Wet manure rather quickly becomes objectionally odorous. One solution to the manure problem would be an economical and efficient means of reducing the moisture content. The concept of sublimation was evaluated as a means of natural drying of poultry manure. The use of a mechanical agitator was incorporated into the system. The drying phenomenon that allows clothes to dry in winter weather would not work with manure. The tiller-drying to accelerate natural drying of manure in summer was very effective. (Christenbury-Iowa State)
W71-06804

CONTROLLING ODORS FROM CATTLE FEED LOTS AND MANURE DEHYDRATION OPERATIONS,
Memphis Cattle Feeders, Inc., Millington, Tenn.
Robert Moorman, Jr.
Air Pollution Control Association Journal, Vol 15, 1965, p 34-35.

Descriptors: *Farm wastes, *Odors, Legal aspects, Dehydration, Spraying, Disposal, Management.
Identifiers: *Feedlots, Public relations.

This paper discusses various methods of odor control for cattle feed lots. The human and physical conditions that exist which allow and cause odor problems to arise and become a community source of trouble are discussed. These include a negative attitude and a lack of understanding on the part of the parties concerned. The odor problems can be alleviated through cooperation and sincere effort. The use of dehydration units have been only partially successful. Public relations between feed lot and the community are very important. (Christenbury-Iowa State)
W71-06805

PROCEEDINGS OF FARM ANIMAL WASTE AND BY-PRODUCT MANAGEMENT CONFERENCE.
Wisconsin Univ., Madison.

University Extension, The University of Wisconsin, November 6-7, 1969. 129 p.

Descriptors: *Farm wastes, *Cattle, *Hogs, *Poultry, *Environment, Social aspects, Economic, Political aspects, Psychological aspects, Air pollution, Water pollution, Soil contamination.
Identifiers: *Management conference.

This conference was held for technical and administrative staff of local, state, regional and federal agencies; for industries and for private citizens who are concerned about or have a responsibility related to the proper management of wastes from farm animal enterprises in Wisconsin. It was an introductory meeting at which the dimensions of the problems were examined, research was reviewed, some alternative manure handling methods were highlighted, public agency roles were outlined and two existing local programs were described. Small group discussions explored future program and research needs. (See also W71-06811 thru W71-06832) (White-Iowa State)
W71-06810

INTRODUCTORY REMARKS,
Wisconsin Univ., Madison. Coll. of Agriculture.
Glenn S. Pound.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, November 6-7, 1969, p 15-16.

Descriptors: *Environment, *Agriculture, Industries, Populations, Priorities, Farm wastes, Food abundance, Education, Research and development, Cattle.
Identifiers: Agricultural power, Industrial power, Meat consumption, Public commitment.

The author points out the public commitment which was made and which today has made America the world's greatest agricultural and industrial power. In our progress we have done real harm to our environment. Public awareness is needed to establish new priorities. To establish new priorities will take courage, great understanding and tolerance. Education and research is badly needed. Vast expenditures of money will be required to reverse the tide. (See also W71-06810) (White-Iowa State)
W71-06811

QUANTITIES AND CHARACTERISTICS OF FARM-ANIMAL WASTES,
Public Health Service, Chicago, Ill. Bureau of Solid Waste Management.
Ralph J. Black, and William Q. Kehr.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, November 6-7, 1969, p 17-21. 3 tab, 6 ref.

Descriptors: *Farm wastes, *Water pollution, Population, Pollution abatement, Confinement pens, California, Solid wastes, Dissolved oxygen, Water quality, Hogs, Cattle, Poultry, Nutrients, Sewage sludge.

Identifiers: Meat consumption, Livestock production, Population equivalent, Land disposal.

The paper points out that an increased population will require much more beef and poultry, thus increasing the agricultural waste problem. Confinement feeding is firmly established, and, while the number of feeding operations is expected to decline, the total production will be increased. The importance of agricultural wastes is brought out in a table showing quantities of solid wastes generated in California. This is magnified by population equivalent data which states that animal wastes were equivalent in pollutional affect to 10 times that of the nation's population. Data is presented on quantities produced and the nutrient value of animal wastes. It is economically unfeasible to utilize this waste for its fertilizer value. The quantity of animal wastes will increase, as will the management problems associated with its handling, treatment and disposal. (See also W71-06810) (White-Iowa State)
W71-06812

HEALTH PROBLEMS,
Wisconsin Univ., Madison. Dept. of Bacteriology.
Elizabeth McCoy.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, November 6-7, 1969, p 22-24.

Descriptors: *Public health, *Farm wastes, *Bacteria, Water pollution, Soil contamination, Coliforms, E. Coli, Streptococcus, Soil, Loam, Rates of application, Sampling, Cores, Adsorption, Percolation.
Identifiers: *Enterocci, Miami silt loam, Die-off.

Animal wastes contain enormous amounts of pollution bacteria. If it finds its way to surface or well waters the water would be reported as 'contaminated.' Bacterial counts made on fresh feces gave the following values: Coliform, 100,000 - 1,000,000/gm.; Enterococci, 1,000,000 - 10,000,000/gm. Experiments were done to trace pollution bacteria in manure applied to soil. Five gallon pails (with bottoms cut out) were set to about three-fourths of their depth in a field of Miami silt loam. Applications of a manure/water slurry were made in 15, 30, and 80 tons per acre amounts. Both types of bacteria were adsorbed with S98..% removal by 14 inches. The soil acts as a very efficient filter. (See also W71-06810) (White-Iowa State)
W71-06813

AESTHETICS AND ODORS,
Wisconsin Dept. of Natural Resources, Madison.
Douglas Evans.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, November 6-7, 1969, p 25-26.

Descriptors: *Farm wastes, *Odors, Aesthetics, Anaerobic conditions, Hydrogen sulfide.
Identifiers: *Odor threshold, Public nuisance, Odor panel, Odor measurement.

The difficulty of evaluating the offensiveness of odors is their subjective nature. Odors from farm animal wastes, particularly anaerobically generated are, in general, offensive, but the substances involved and the thresholds of detection are little known. Typical odor thresholds are given when determined by a trained panel. A method is outlined for eliminating panel members insensitive to odors. More needs to be known about the type, quantity and odor threshold of the various compounds involved in farm animal wastes. From this better methods of treating, storing, handling and disposing of wastes may be developed which will reduce or eliminate the odor problem. (See also W71-06810) (White-Iowa State)
W71-06814

DEAD ANIMALS AND HOW THEY CONTRIBUTE TO POLLUTION OF THE ENVIRONMENT,
Department of Agriculture, Madison, Wis.
A. A. Erdmann.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, November 6-7, 1969, p 27-29.

Descriptors: Transportation, Costs, Livestock, Legislation, Water pollution, Environment, Wisconsin.
Identifiers: *Dead animal disposal, *Rendering plants, Slaughter plant scraps, Carcasses.

The article describes why dead animals are fast becoming a pollution problem. Where once rendering plants paid to pick up dead animals they now charge livestock owners a fee for pick-up and disposal of livestock losses. The number of dead animals being sent to rendering plants has decreased by about 50%. Some legislation concerning the problem is encouraging. The author expects the problem of dead animal disposal to increase in the future. The problems of the rendering plant industry, such as added labor costs, collection costs, and, perhaps most important, the inferior product resulting from such operations, will probably make it necessary to use a different method of disposal of dead animals than is now followed. (See also W71-06810) (White-Iowa State)
W71-06815

WATER QUALITY PROBLEMS,
Wisconsin Dept. of Natural Resources, Madison.
F. H. Schraufnagel.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 30-32, November 6-7, 1969. 7 ref.

Descriptors: *Water quality, *Farm wastes, Water pollution sources, Fishkill, Fish, Dissolved oxygen, Nutrients, Nitrogen, Nitrates, Phosphorus, Eutrophication, Base flow, Ammonia, Coliforms, Cattle, Wisconsin.
Identifiers: *Land disposal, Concentrations, Feedlots.

Probably the biggest concern in Wisconsin about pollution from farm animal wastes is because of their nutrients. Nitrogen and phosphorus are the two significant nutrients causing eutrophication in lakes and streams. Land disposal is usually an effective way to prevent pollution except when wastes are applied to frozen ground. Data from the nutrient content of base flows generally indicates that percolation through the ground eliminates most of the phosphorus and nitrogen. The potential for pollution from animal wastes is very great. The likelihood of pollution from cattle will increase with manure fluidization and water carriage systems. The maintenance of water quality depends on research and development of techniques to control the problem. (See also W71-06810) (White-Iowa State)
W71-06816

FUTURE TRENDS IN LIVESTOCK PRODUCTION,
Wisconsin Univ., Madison. Coll. of Agriculture.
Robert W. Bray.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 33-35, November 6-7, 1969.

Descriptors: *Farm wastes, *Livestock, Cattle, Poultry, Hogs, Automation, Confinement pens, Odors, Waste disposal.
Identifiers: *Livestock numbers, Dairy cattle, Beef cattle, Feedlots, Horses, Waste management.

The author summarizes the article by saying that (1) livestock numbers will increase in the future and (2) the most economical management systems for all classes of livestock will result in larger numbers and more confinement in each livestock enterprise. Thus, the solid waste management or disposal problems associated with livestock production in Wisconsin will become more complex. The author gives his ideas as to what changes in production can be expected for dairy, beef, swine, poultry, and other operations. (See also W71-06810) (White-Iowa State)
W71-06817

WHAT AND WHERE ARE THE CRITICAL SITUATIONS WITH FARM ANIMAL WASTES AND BY-PRODUCTS IN WISCONSIN,
Wisconsin Univ., Madison.
M. T. Beatty, J. E. Kerrigan, and W. K. Porter.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 36-57, November 6-7, 1969. 4 tab, 12 fig.

Descriptors: *Farm wastes, *Wisconsin, *Spatial distribution, Environment, Soils, Surface waters, Groundwater, Land resources, Livestock, Cattle, Hogs, Poultry, Population, Geology, Hydrology, Precipitation, Standards, Water quality, Nitrogen, Nitrates, Odor, Watersheds, Bedrock.
Identifiers: *By-products, Earth resources, Soil associations, Critical situations.

Where and to what extent various kinds of critical situations develop, depends on the interaction of several components of the waste production and management system. These include: the kinds and amounts of wastes and by-products produced; the spatial distribution of the sources; the proximity to people; the physical environment- characteristics of the soils, the landscape, the surface water and groundwater systems, and; the uses and demands on water and land resources. Numerous tables and charts point up the importance of these components. Seven critical situations, the problems and locations involved, are then explained. They include livestock concentrations near urban areas, large livestock concentrations, livestock in watersheds with lakes, and livestock concentrations on shallow soils over previous bedrock as well as others. (See also W71-05810) (White-Iowa State)
W71-06818

CONSIDERATIONS IN SELECTING DAIRY MANURE DISPOSAL SYSTEMS,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
O. I. Berge, E. G. Bruns, T. J. Brevik, and L. A. Brooks.
In: Proceedings of the Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 58-69, November 6-7, 1969. 10 tab, 1 fig, 1 ref.

Descriptors: *Farm wastes, *Cattle, Labor, Odor, Investment, Storage, Storage tanks, Annual costs, Value, Nitrogen, Phosphorus, Potassium, Urine, Equipment, Wisconsin.
Identifiers: *Dairy cattle, *Manure disposal systems, Hauling, Stacking, Manure handling.

Different methods of handling dairy manure and disposing of it are discussed. Advantages and disadvantages are listed. The three basic systems include daily hauling, stacking, and liquid manure storage. Investment and annual costs are compared for the three systems under similar stanchion and free stall housing operations. Dairy manure is valued at $1.40/ton for its nutrient content. Various types of handling equipment are discussed as well as a few disposal methods. (See also W71-06810) (White-Iowa State)
W71-06819

ENGINEERING RESEARCH ON FARM ANIMAL MANURE,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
Clyde Barth.

In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 70-79, November 6-7, 1969. 2 tab, 6 ref.

Descriptors: *Farm wastes, *Biological treatment, Disposal, Livestock, Anaerobic digestion, Waste storage, Lagoons, Aerobic treatment, Waste dilution, Temperature, Rotors, Irrigation, Odor, Gases.
Identifiers: *Waste management, Waste characteristics, Anaerobic lagoon, Aerobic lagoon, Oxidation ditch, Composting, BOD removal, Land application, Coprophagy, Chemical treatment, Solid-manure waste.

The article reviews different treatment and disposal methods which are currently being used or investigated. Anaerobic and aerobic lagoons are used but are limited by temperature and odor problems. The oxidation ditch can be used for swine but its use is uncertain for wastes from other livestock. Composting, though effective, lacks a market for its finished product. Land application continues to be the most widely used type of livestock waste disposal. Irrigation and plow-furrow-cover applications are a modification of land disposal. Chemical treatment, dehydration, incineration, and coprophagy are being studied, but no conclusions have been drawn. Odor and gas production are problems not well understood and difficult to control. Solid manure, because of the lack of problems associated with its handling, deserves serious consideration in any animal waste handling situation. (See also W71-06810) (White-Iowa State)
W71-06820

NATION-WIDE RESEARCH ON ANIMAL WASTE DISPOSAL,
Federal Water Pollution Control Administration, Chicago, Ill. Lake Michigan Basin Office.
Jacob O. Dumelle.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 80-81, November 6-7, 1969.

Descriptors: *Farm wastes, *Research and development, Grants, Algae, Air pollution, Water pollution, Soil contamination, Nutrients.
Identifiers: *FWPCA, Activated algae, Feedlots, Oxidation ditch.

The article gives brief descriptions of research projects which the Federal Water Pollution Control Administration is helping to fund. One such project under way in California is trying to determine the practicability of producing and harvesting algae to remove nutrients from agricultural drainage waters. Other projects involve cattle feedlot runoff, and dairy waste waters. Besides research on treatment methods, some projects are trying to find out how much nutrient runs off, and how much gets into water. (See also W71-06810) (White-Iowa State)
W71-06821

WATER RESOURCES CENTER RESEARCH ON ANIMAL WASTES AND WATER QUALITY,
Wisconsin Univ., Madison. Water Resources Center.
J. E. Kerrigan.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 82-85, November 6-7, 1969.

Descriptors: *Farm wastes, *Water quality, Eutrophication, Research and development, Wisconsin, Legislation, Water resources, Environment, Resources.
Identifiers: *Water Resources Center, Water research.

The function and goals of the University of Wisconsin's Water Resources Center are pointed out. The Center got its start from faculty committees formed to study groundwater and subsequently lakes and streams. It was then assigned state responsibility by the legislature for the coordination and administration of an interagency water resources research and data collection program. Lists of objectives and functions of the Water Resources Center are given. If Wisconsin is to have a well balanced research program for water quality management, it is necessary to direct the limited available financial support to researchers with specially developed talents to solve specific problems that merit consideration. A generous amount of effort must be expended to identify the real problems. (See also W71-06810) (White-Iowa State)
W71-06822

THERE'S HOPE AHEAD,
Wisconsin Univ., Madison. Dept. of Poultry Science.
John Skinner.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 86-90, November 6-7, 1969.

Descriptors: *Farm wastes, *Odor, Land use, Population, Management, Poultry, Foods, Agriculture.
Identifiers: Manure handling, Public relations, Goals, Land use planning.

Examples are cited of problems which have been turned into profitable industries; this can also be done with animal wastes. The increasing urban population will demand that animal wastes and their associated odors be disposed of at least cost to the meat consuming public. We must first dedicate ourselves to finding answers to the animal waste disposal problem. We must have full realization and appreciation of the cause, extent and consequences of the problem by all concerned. Better land use planning is needed as well as progressive regulations and laws. Better public relations must be created for all of agriculture and agriculturally related industries. Emphasis is placed on realizing the consequences of what we are doing today. The author proposes a goal of 'rendering inoffensive those parts of animal waste and by-products which are disagreeable to the public in general.' (See also W71-06810) (White-Iowa State)
W71-06823

INTRODUCTION TO FEDERAL, STATE AND LOCAL ACTION PROGRAMS TO SOLVE ANIMAL WASTE DISPOSAL PROBLEMS,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
Douglas A. Yanggen.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 91, November 6-7, 1969.

Descriptors: *Farm wastes, Water pollution, Agriculture, Environment, Government supports, Cost sharing, Education, Regulation.
Identifiers: *Government programs, Technical assistance, Subsidy.

An introduction is given for following articles on governmental programs which include technical assistance, cost sharing, regulation and education at federal, state and local levels. Those included illustrate the various techniques for influencing private decision making. (See also W71-06810) (White-Iowa State)
W71-06824

THE ROLE OF THE FEDERAL WATER POLLUTION CONTROL ADMINISTRATION IN FARM ANIMAL WASTE AND THE BY-PRODUCT MANAGEMENT,
Federal Water Pollution Control Administration, Chicago, Ill. Great Lakes Region.
Frank E. Hall.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 92-95, November 6-7, 1969.

Descriptors: *Farm wastes, *Water pollution, Research and development, Federal government, Disposal, Grants, Water pollution control, Lake Erie, Water quality, Standards, Legislation.
Identifiers: *FWPCA, Animal waste disposal, Agricultural practices, Feedlots, Enforcement actions, Water quality standards.

A discussion is presented stating how the programs of the Federal Water Pollution Control Administration relate to farm animal wastes and by-product management. Examples are given of government and in-house research activities. Mention is given of those FWPCA supported activities that relate directly to the control of pollution from farm animals. These include pollution surveillance and water quality monitoring among others. The author feels that the most significant recent accomplishment in water pollution control is the establishment of water quality standards. (See also W71-06810) (White-Iowa State)
W71-06825

TECHNICAL ASSISTANCE AVAILABLE FROM THE SOIL CONSERVATION SERVICE,
Soil Conservation Service, Madison, Wis.
Jack Densmore.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 96-97, November 6-7, 1969.

Descriptors: *Farm wastes, *Soil conservation, Surface runoff, Diversion, Grassed waterways, Terracing, Waste storage.
Identifiers: *Technical assistance, Soil Conservation Service, Farm waste disposal, Feedlot.

Situations in which technical assistance from the Soil Conservation Service (SCS) might be useful for reducing pollution from farm wastes are listed. Although the list is not all inclusive it gives an idea of assistance that can be obtained. An inventory and analysis of existing and potential areas where farm waste disposal may be a problem is needed. Technical assistance is available from the SCS to help on farm waste disposal problems, under the following limitations: (1) where the solutions involve techniques of soil and water conservation; (2) with the priorities established from time to time by local soil and water conservation district supervisors; and, (3) within the limitations of available man-power. (See also W71-06810) (White-Iowa State)
W71-06826

COST-SHARING UNDER THE AGRICULTURAL CONSERVATION PROGRAM,
Agricultural Stabilization and Conservation Service, Madison, Wis.
Kenneth H. Hoover.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 98-100, November 6-7, 1969.

Descriptors: *Farm wastes, *Cost sharing, Pollution abatement, Soil conservation, Water conservation, Sedimentation.
Identifiers: ASCS, *Agriculture Conservation Program.

Practices and objectives of the Agricultural Conservation Program (ACP) have been broadened to include pollution abatement, provided such practices also result in soil and/or water conservation. The Agricultural Stabilization and Conservation Service (ASCS) manages program funds of the ACP. A list of components that ought to be included in pollution abatement cost-sharing practices is given. Most practices receive cost-sharing at 80% of cost. Farmer acceptance and financial contribution are needed to accomplish the stated objectives. (See also W71-06810) (White-Iowa State)
W71-06827

THE REGULATORY ROLE OF THE DEPARTMENT OF NATURAL RESOURCES,
Wisconsin Dept. of Natural Resources, Madison. Div. of Environmental Protection.
Thomas G. Frangos.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 101-104, November 6-7, 1969.

Descriptors: *Farm wastes, *Legislation, Water pollution, Pollution abatement, Wisconsin, Water quality, Regulation, Industrial wastes.
Identifiers: *Department of Natural Resources, Feedlots.

Statutes which point out the authority for Wisconsin water pollution abatement are cited. Other statutes are aimed at prevention and enforcement of sporadic discharges into streams. Based on these statutes, it is clear that the Wisconsin Department of Natural Resources has adequate authority to implement a program of pollution abatement aimed at any source of pollution. Difficulties in implementation include tradition, procedures, and lack of staff and funds. Any solution to the complex animal waste problem will involve a mix of programs, combining regulation, research, education, financial assistance, voluntary actions by landowners and possibly even tolerance on the part of the non-farm population. (See also W71-06810) (White-Iowa State)
W71-06828

COLUMBIA COUNTY PROGRAM,
Columbia County Office, Portage, Wis.
Joe Tuss.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 105-107, November 6-7, 1969.

Descriptors: *Farm wastes, *Nitrates, Water pollution, Air pollution, Odor, Pollution abatement, Zoning, Wells, Wisconsin.
Identifiers: Feedlots, Livestock concentration.

The Columbia County Extension Service was charged with formulating a 15 man farmer committee to study the present situation in view of pending proposed requirements of animal and agricultural waste disposal. It will make recommendations for preventing agricultural pollution in current problem areas and in expanding agricultural enterprises. A joint program by Columbia County Health Services, Zoning Administration and the University Extension formulated a project to sample well water for nitrates. Over 800 wells have been sampled. Forty-three percent of the high nitrate problem is on farms with high concentration of livestock. The public's demand for clean air, water and environment can be met by programs which involve the items of concern mentioned as well as others. (White-Iowa State)
W71-06829

WHAT ARE THE PROBLEMS IN WALWORTH COUNTY,
Walworth County Zoning and Sanitation Office, Elkhorn, Wis.
James Johnson.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 108-110, November 6-7, 1969.

Descriptors: *Farm wastes, *Water pollution, *Zoning, Pollution abatement, Eutrophication, Nutrients, Water resources, Land use, Lakes, Urbanization, Education, Erosion control, Land development, Regulation, Wisconsin.
Identifiers: Problem areas, Soil capabilities, Feedlots, Regional Plan.

Increased urbanization resulting in land use conflicts is the overall problem in Walworth County, Wisconsin. As a result, the water resources are deteriorating at an alarming rate. Eutrophication, erosion and nutrient pollution are the major causes. The Regional Plan, properly implemented will regulate growth in such a way as to prevent many problems before they occur. The Walworth County Sanitary Ordinance was a pioneering effort in pollution control which regulated urban growth through the use of soil surveys. The Ordinance will implement zoning by defining 'County Conservation Standards'; which are all of the recommended conservation practices of the Soil Conservation Service. Much can be accomplished with local regulations, but education is essential to sell the program. (See also W71-06810) (White-Iowa State)
W71-06830

ROLE OF UNIVERSITY EXTENSION,
Wisconsin Univ., Madison. Div. of Economic and Environmental Development.
Gale Vandeberg.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 111-113, November 6-7, 1969.

Descriptors: *Farm wastes, *Environment, Education, Universities, Research and development, Regulation, Water pollution, Wisconsin.
Identifiers: *University Extension, Adult education.

The challenge to Extension lies in the broad and continuous education of the public so that a pleasing and healthful environment may be maintained. The University Extension combined with the technical, financial and regulatory resources of other state and federal agencies has the resources to reduce the animal waste management problem. The University Extension staff has the responsibility to help various groups and the public to understand the problems and the alternatives; to help people who need to organize for action to do so; and to help groups and individuals to know what they can do, how to do it, and what resources are at their disposal. (See also W71-06810) (White-Iowa)
W71-06831

WHERE DO WE GO FROM HERE,
Wisconsin Univ., Madison. Dept. of Meat and Animal Science.
Richard H. Vilstrup.
In: Proceedings of Farm Animal Waste and By-Product Management Conference, University Extension, University of Wisconsin, p 114-115, November 6-7, 1969.

Descriptors: *Farm wastes, *Environment, Wisconsin, Technology, Education, Research and development, Regulation, Legislation.
Identifiers: Waste management, Waste utilization.

The author attempts to briefly summarize the ideas and presentations made at the conference. He points out that the waste management problem has many dimensions, including environmental, social, economic, physical, political and psychological. There is an increasing concern for the quality of environment in Wisconsin. As such, research and education are needed in many areas. Five specific recommendations for continued emphasis in the waste management area are made. Recommendations are also made for educational development. (See also W71-06810) (White-Iowa State)
W71-06832

WATER SUPPLY AND WASTE DISPOSAL,
W. A. Hardenbergh, and Edward B. Rodie.
International Textbook Company, Scranton, Pa, 1969. 513 p.

Descriptors: *Water supply, *Waste disposal, *Sanitary engineering, *Design, *Operations, *Industrial wastes, *Waste water treatment.

This volume presents the theory and practices relating to the interrelationship between the basic problems of water supply and waste disposal. The authors provide an integrated treatment of the fundamentals common to both of these areas of sanitary engineering. Detailed are the design and operation of systems for water supply and waste disposal. Problems in water supply caused by over-population and expansion plus unusual disposal dilemmas created by increased amounts of industrial waste products are described, and some solutions are proposed. The first nine chapters concern basic principles of water supply and waste disposal including: water use and sewerage volume, piping for water and sewage systems, and the collection and storage of water. The last fourteen chapters relate to either problems or solutions such as: water treatment by screening and sedimentation; control of corrosiveness, taste, and odor; sludge treatment and disposal; filtration and disinfection of water; removal of dissolved minerals from water; the activated sludge process; and primary and secondary sewage treatment. (See also W71-06880 thru W71-06884)
W71-06879

THE WATER-SEWAGE CYCLE,
W. A. Hardenbergh, and Edward B. Rodie.
In: Water Supply and Waste Disposal, International Textbook Company, Scranton, Pa, Chapter 1, p 1-7, 1960. 4 fig, 6 ref.

Descriptors: *Water supply, *Sewage disposal, *Storm drains, *Sewage treatment, *Water treatment, Separation techniques.
Identifiers: *Storm sewers.

This chapter enumerates the functions of water supply and sewage disposal systems and discusses terminology, financing, and other elements of each system. A section on storm drainage recommends the provision of separate sewage and stormwater systems when sewage treatment is required. General information on water and sewage treatment is also included in this chapter. (See also W71-06879)
W71-06880

QUANTITY OF WATER FROM RAINFALL,
W. A. Hardenbergh, and Edward B. Rodie.
In: Water Supply and Waste Disposal, International Textbook Company, Scranton, Pa, Chapter 2, p 8-39, 1960. 13 fig, 6 tab, 11 ref.

Descriptors: *Rainfall, *Snowfall, *Runoff, *Streamflow, *Measurement, *Water yield, *Surface waters, *Water quality, *Rainfall disposition, *Storm drains, *Design, *Rational formula, *Runoff forecasting, Groundwater, Percolation, Evaporation, Absorption.

The first three sections of this chapter involve rainfall and snowfall, rain measurement, and rain making. Next, runoff is described with a method for measuring streamflow. Other sections discuss the estimation of watershed yield, empirical formulas for runoff of water supply, an investigation of the source for yield, and the quality of surface water. Rainfall-runoff proportions, along with rainfall rate and duration, are cited as important criteria for designing storm drainage facilities. Techniques for computing these three elements are given including the Rational Method and the Burkli Zeiger empirical formula for determining runoff. Other topics treated in the chapter include: percolation and absorption, evaporation, and groundwater. (See also W71-06879)
W71-06881

HYDRAULICS OF WATER AND SEWER CONDUITS,
W. A. Hardenbergh, and Edward B. Rodie.
In: Water Supply and Waste Disposal, International Textbook Company, Scranton, Pa, Chapter 4, p 59-72, 1960. 5 tab, 3 fig, 2 ref.

Descriptors: *Pipe flow, *Pipes, *Sewers, Mannings equation, Hydrualic design.
Identifiers: *Sewer hydraulics.

General formulas describing the flow of water in pipes are used to compute pipe sizes. Such formulas and other aspects of flow in water pipes are presented in this chapter. Flow in sewers is described specifically with reference to the Manning Formula and other formulas. Additional topics discussed are: limiting velocities in sewers, and the design of full and partly filled sewers excluding circular sewers. (See also W71-06879)
W71-06882

PIPING FOR WATER AND SEWER SYSTEMS,
W. A. Hardenbergh, and Edward B. Rodie.
In: Water Supply and Waste Disposal, International Textbook Company, Scranton, Pa, Chapter 5, p 73-98, 1960. 22 fig, 3 tab, 10 ref.

Descriptors: *Water supply, *Construction, *Construction materials, *Sewers, Design, Piping systems (Mechanical).
Identifiers: Pipe construction.

Requirements for the construction of water supply and sewer pipes are listed, and descriptions of the most commonly-used materials are included. Cast-iron, asbestos-cement, concrete, and steel are discussed in terms of their use in water supply pipe construction. Vitrified-clay, concrete, and asbestos-cement are described for sewer pipes. Other topics in this chapter are: service pipes, electrolysis, water hammer, the thickness of metal pipe, appurtenances for water systems (valves, meters, hydrants) and for sewers (manholes, drop manholes, inlets, catch basins, flush tanks, diverting weirs, inverted siphons, and outlets), junctions of large sewers, loads on pipes in trenches, and the testing of sewer pipe strength. (See also W71-06879)
W71-06883

COLLECTION AND TRANSPORTATION OF SEWAGE,
W. A. Hardenbergh, and Edward B. Rodie.
In: Water Supply and Waste Disposal, International Textbook Company, Scranton, Pa, Chapter 8, p 161-190, 1960. 3 tab, 8 fig, 4 ref.

Descriptors: *Sewerage, *Sewers, *Storm drains, *Design standards, *Specifications, Runoff, Time of concentration, Construction, Measurement.
Identifiers: *Storm sewers, *Capacity, Combined sewers, Curved sewers.

Subjects discussed in this chapter include: the layout of a sewerage system, the position of the sewer in the street, the procedure for establishing layout, and the design of sanitary sewers. Also described is the design of a storm drainage system including information of the inlet time or time of concentration, runoff, sizes and gradients of storm sewers, and inlet capacity. Combined sewers, noted to be rarely-built, follow the same design as that for storm sewers although their shape may be modified. Sewer construction, infiltration measurement, records, and curved sewers are additional topics explored. (See also W71-06879)
W71-06884

THE UNABATED GROWTH OF WATER POLLUTION ABATEMENT ACTIVITIES,
For primary bibliographic entry see Field 05D.
W71-06889

A DYER'S 'OPERATION CLEANUP',
S. M. Suchecki.
Textile Industries, Vol 130, No 6, p 113-122, p 136 and p 175, 1966. 1 fig.

Descriptors: Biochemical oxygen demand, *Water pollution control, New Jersey, Legal aspects.
Identifiers: *Dyehouse wastes, Washington (NJ).

In February 1966 the State of New Jersey Department of Health issued an order against the Northern Dyeing Company of Washington, New Jersey, requiring that the firm cease pollution prior to June 1, 1966. The history of this plant and its problems and efforts relative to water pollution are traced. The matter of pollution has become the subject of controversy in the area. The company has taken action but it is concluded that more rainfall would be helpful. (Livengood-North Carolina State)
W71-06891

DETROIT'S METROPOLITAN WATER POLLUTION CONTROL PROGRAM - IN ACTION,
Gerald J. Remus.
The Engineer and the City, p 91-96, 1969.

Descriptors: Water pollution control, *Cities, Project planning, Multiple-purpose projects, *Sewerage, *Storm runoff, *Control systems, *Sewage disposal, Estimated costs, *Construction costs, Instrumentation, Waste water treatment.
Identifiers: *Detroit, *Combined sewers.

The adoption of metropolitan programs for water supply, pollution control, and sewage treatment in the Detroit area received its impetus in 1959. A brief review of the growing acceptance of the programs is given. The sewage system for Detroit operates on a combined stormwater-sanitary sewage basis with the use of remote controls, automatic alarms, and computer recordings (including records on how a storm crosses a metropolitan area). The stormflow dirt deposit to the Detroit River has been reduced by at least 15%: and because of the sewer control instruments flooding of the activated sludge process at the plant. Approximately $371 million will be spent from 1966 to 1975 on this water pollution control program. Recommendations for further studies and programs are made by the author, and an estimated cost list on the sewage disposal construction (1968-1970) is given.
W71-06892

DEVELOPMENTS IN STORM AND COMBINED SEWER POLLUTION CONTROL,
William A. Rosenkranz.
Paper presented at the Spring Meeting of the New England Water Pollution Control Association, Jun 11, 1968.

Descriptors: *Water pollution control, *Sewage treatment, Application methods, Waste water treatment.
Identifiers: *Stormwater pollution, *Combined sewage, Sewer separation, Storm sewers.

Three basic approaches used to minimize combined sewage or stormwater pollution are defined as: (1) control, (2) treatment, and (3) combinations of the two. Examples are given under each category. Considering progress thus far, it is unlikely that any single control or treatment method developed will successfully solve combined sewer or stormwater pollution problems. Instead, methods providing whole or partial solutions based on particular circumstances of the area will be integrated into the combined sewer or stormwater project. Methods of control and/or treatment described include: screening, disinfection, sedimentation, in-system storage, off-system storage, chemical treatment, automated regulators, and sewer separation. Sewer separation continues to maintain the widest amount of present and planned use and predicted applicability.
W71-06893

NEW INFORMATION NEEDS FOR WATER MANAGEMENT IN URBAN REGIONS,
John R. Sheaffer.
Paper presented at the Am Geophys Union - 1969 National Fall Meeting.

Descriptors: *Water management (Applied), Investigations, *Michigan, Pollutants, Planning, *Regions, Water pollution control, *Cities, Urbanization.
Identifiers: *Urban water resource management.

To illustrate the new information needs for water management in urban areas, a case study of a waste water management plan is described and the types of data required in the formulation of the plan are identified. Muskegon County, Michigan, is the study area. The basic management concept set forth in the research creates new information needs. The concept is one of utilizing pollutants as resources out of place and, thus, converting them into economic goods. This goal is accomplished by taking the waste from the water, processing it, and putting it on the land, where it becomes useful and valuable. The environmental implications and the data needs for such a program can be viewed readily in the context of this new type of urban water resource management. It is obvious that adjustments in mapping techniques will be necessary to accommodate future management efforts.
W71-06896

GOVERNOR'S CONFERENCE ON WATER RESOURCES MANAGEMENT IN WISCONSIN.
For primary bibliographic entry see Field 06E.
W71-06910

FEDERAL LEGISLATION--WATER QUALITY AND WATER RESOURCES--IMPACT ON WISCONSIN,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 06E.
W71-06911

STATEMENT OF ASSEMBLYMAN GEORGE M BORG,
For primary bibliographic entry see Field 06E.
W71-06913

WATER LEGISLATION IN THE 90TH CONGRESS.
League of Women Voters, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-06914

WATER: INDUSTRY CHALLENGE - TODAY,
S. M. Suckecki.
Textile Industries, Vol 130, No 6, p 108-110, 1966.

Descriptors: Water quality, Legal, *Water quality act, Industrial wastes, *Water pollution.
Identifiers: Textile mill wastes.

The Water Quality Act of 1965 is the basis of federal water quality standards. The current (1966) daily consumption of water is about 355 billion gallons, of which about 160 billion is used by industry. In 1980 it is estimated these figures will reach 600-650 and 395, respectively. The textile industry requires large amounts of water, and several organizations such as the American Associaton of Colorists and Chemists are supplying information to the industry. (Livengood-North Carolina State)
W71-06915

MANUAL OF INDIVIDUAL WATER SUPPLY SYSTEMS.
Department of Health, Education, and Welfare, Washington, D.C.; and Public Health Service, Washington, D.C.
For primary bibliographic entry see Field 05F.
W71-06959

CHICAGO SANITARY DISTRICT IN NEW POLLUTION FIGHT.

Civil Eng, Vol 37, No 10, p 98, Oct 1967.

escriptors: *Tunnel construction, *Storm runoff, ewage, *Tunnels.
entifiers: *Chicago, Illinois.

part of Metropolitan Chicago's ten-year pro-am to combat water pollution, a deep tunnel wage plant is being proposed for completion by 72 to store excess floodwaters from severe rain-orms in underground chambers. Stormwater ru-ff will be prevented from entering sanitary wers, and the water will later be released under ntrolled conditions. The estimated cost of the ep tunnel project is $750 million, which is much s than the $3-billion it would cost to construct parate storm and sanitary sewage systems. Other oposed programs include chlorination of all cilities by 1968, elimination of visible solids by 69, and construction of a tertiary waste-treat-nt plant in Hanover, Ill. by 1971.
71-06971

WER MOLE TRIMS COST OF TUNNEL RIBS ND CONCRETE.
r primary bibliographic entry see Field 08H.
71-06975

VED WAY FOR TRANSOONA'S LONG OLE.
r primary bibliographic entry see Field 08H.
71-06976

EEP TUNNEL STORAGE MAY SOLVE CITY ORM WATER PROBLEM.

viron Scie Technol, Vol 3, No 3, p 209-211, Mar 69.

escriptors: *Storm runoff, *Pollution abatement, ewage treatment, *Runoff, *Cost comparisons, ost analysis, *Water quality, Overflow, ochemical oxygen demand.
entifiers: *Deep tunnel plan, *Chicago, Com-ned sewers.

e Metropolitan Sanitary District of Greater icago (MSD) has a plan devised for the control pollution from storm and combined sewer water noff--the Chicagoland Deep Tunnel Project. This n would: capture flow from a 300 square-mile ction; cost approximately $1.02 billion ($.02 bil-n more than the present sewage treatment facili-s' cost); and, almost completely remove BOD m the stormwater runoff at 1/4 the cost of ailable alternatives. The Harza Engineering Co. d Bauer Engineering Inc. are the two consulting ms working on the project which may develop o a $2.2 billion water quality program. Com-nts by Vinton Bacon, general manager of the nitary district, are made on the urgency of the oject, the necessary reasons for the project, and e benefits from the project. A cost list is given as ll as a short description of the tunnel system out.
71-06981

ODERN TUNNELING METHODS USED ON OLTON SEWER.
r primary bibliographic entry see Field 08H.
71-06982

ASER BEAM ON MOLE SPEEDS SEWER ORK,
r primary bibliographic entry see Field 08H.
71-06986

LICATE TREATMENT FOR ACID MAIN RAINAGE PREVENTION, SILICATE AND LUMINA/SILICA GEL TREATMENT OF OAL REFUSE FOR THE PREVENTION OF CID MINE DRAINAGE.
vco Labs., Inc., Waltham, Mass.
r primary bibliographic entry see Field 05D.
71-07052

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

EFFICIENCY OF HYDROLOGIC DATA COLLECTION SYSTEMS, ROLE OF TYPE I AND II ERRORS,
Arizona Univ., Tucson. Dept. of Systems Engineering.
For primary bibliographic entry see Field 07A.
W71-06576

EFFICIENCY OF PARAMETER AND STATE ESTIMATION METHODS IN RELATION TO MODELS OF LUMPED AND DISTRIBUTED HYDROLOGIC SYSTEMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 07A.
W71-06577

ERROR ANALYSIS AND SYSTEM IDENTIFICATION OF WATER BALANCE AND THE RAINFALL EXCESS COMPONENT IN REAL AND MODEL WATERSHEDS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
Chester C. Kisiel, Hasan K. Qashu, and James J. Rogers.
Research Report, Presented at Fall National Meeting of the American Geophysical Union, San Francisco, California, December 7-10, 1970. 28 p, 1 fig, 26 ref. OWRR Project B-007-ARIZ (9).

Descriptors: *Water balance, *Rainfall-runoff relationships, *Hydrologic budget, *Estimating, *Time, *Decision making, Flood control, Water yield, Sampling.
Identifiers: *Error analysis, *Bayesian theory, Space.

For purposes of estimating water balance and flood hydrographs in determination of the water yield or rainfall excess component classical methods were reviewed in the light of recent developments in parameter estimation theory (including the theory for unscrambling of observed time series) and decision theory. Theoretical and practical aspects of budget equations as used in the analysis of discrete events (such as a single rainfall-runoff pairs over a period of hours or days) and in the analysis of hydrologic budgets over much larger time units such as a month and year were also reviewed. Considered were measurement and sampling errors and time-dependency in a scientific and decision framework, and the effects of noisy instruments and sampling variability in space and time as a function of physically-meaningful parameters. Error propagation was discussed in terms of reliability of water yield estimates. The Bayesian framework which addresses itself to the 'best' action, design, or decision in the face of overestimation and underestimation errors around an unknown true value estimate was cited as a possible resolution to small sample estimation error. (See also W71-06576) (Kriss-Cornell)
W71-06578

SYSTEMS THEORY: A NEW APPROACH FOR MODELLING WATERSHEDS REALISTICALLY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
James J. Rogers, Hasan K. Qashu, and Chester C. Kisiel.
Research Report, December 1970. 9 p, 1 fig, 12 ref. OWRR Project B-007-ARIZ (10).

Descriptors: *Mathematical models, *Watersheds (Basins), *Systems analysis, *Hydrologic aspects, Input-output analysis, Time, Equations.

The purpose of this paper was to discuss model description in terms of mathematical systems theory which subsumes the classes of models represented by the theory of differential equations and by sequential machines. Six items which describe a model according to systems theory were discussed as to their roles in hydrologic modeling. They included: (1) a set of possible inputs such as climatic inputs, model parameters, and physical constants which are required inputs, (2) a time scale, either continuous or discrete, (3) a set of admissible input functions to define the way inputs are organized in time, (4) a set of states determined by examining equations and listing those variables needed to perform all calculations, (5) a state transition function to compute the state of the system at time t given and input function and the initial state which determines (6) the behavior of the system. It was believed that systems theory will provide a unifying theoretical approach to problems of system modeling in hydrology. (See also W71-06576) (Kriss-Cornell)
W71-06579

EXPERIMENTAL PROGRAM FOR ANALYSIS AND VALIDATION OF WATERSHED MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
Hasan K. Qashu, James J. Rogers, and Chester C. Kisiel.
Research Report, Presented at the National Winter Meeting of AGU, San Francisco, December 7-10, 1970. 10 p, 6 fig. OWRR Project B-007-ARIZ (11).

Descriptors: *Mathematical models, *Computer programming, *Hydrologic data, *Optimization, *Meteorological data, *Watersheds (Basins), Water balance, Rainfall simulators, Data collections.
Identifiers: *Field data.

An experimental program for measuring spatial and temporal variabilities of the elements of water and energy balances was proposed in order to attain the ultimate objective of hydrologic modeling--to predict interactions and outputs of water from the system with known certainty. The discussion was restricted to description of methods used in acquisition of field data. Standard meteorological instruments used included 2 types of rain gages, evaporation pan, net radiometers, heat flow discs, thermistor and diode-type temperature sensors, black and white pyranometers, and psychrometers. Modified sensors and equipment developed included: transducer assemblage, rainfall simulator, and surface delimitors. A data acquisition system capable of varying scanning rates, frequencies of scanning and input signal controls was used to record data on magnetic tape. Rainfall, interception, temperature, radiation, humidity, and changes in soil water storage were monitored with regulated frequencies. The derived mathematical model was developed to allow for simulation of abiotic-biotic interactions in the system. The area was decomposed into subsystems according to soil, vegetative cover, micromorphology, and topographic conditions. The program seemed to provide an effective tool for acquisition of data needed for the development of a physical model. (See also W71-06576) (Kriss-Cornell)
W71-06580

A SIMULATION OF IRRIGATION SYSTEMS--THE EFFECT OF WATER SUPPLY AND OPERATING RULES ON PRODUCTION AND INCOME ON IRRIGATED FARMS,
Economic Research Service, Fort Collins, Colo. Natural Resource Economics Div.
Raymond L. Anderson, and Arthur Maass.
Technical Bulletin No 1431, January 1971. 57 p, 9 fig, 12 tab, 3 append, 28 ref.

Descriptors: *Digital computers, *Systems analysis, *Simulation analysis, *Water resources development, *Water supply, *Irrigation systems, Decision making, Crop production, Income.

The use of a digital computer model of irrigation systems, designed to permit examination of the effects of varying water supply restrictions, water delivery rules, and crop patterns on crop production and farm income in an irrigated area, was described and illustrated. The main objective was to develop and test procedures by which operators and builders of irrigation systems can evaluate and compare alternative methods of distributing water among farmers. The model simulated decision making at several levels of activity in an irrigation system and took into account the responses of different crops to irrigation water. Different decision making activities were assigned to 10 principal phases or subroutines in the general program. Two special subroutines were developed: the first (PLAN) determined the optimum crop pattern in response to a predicted water supply; and the second (REPLAN) reordered farm crop patterns and watering sequences if a water supply became severly short at any time during the season. A third subroutine (TRACE) called for a printout of some of the information used internally in selecting crop watering sequences. Use of the model was illustrated by applying it to a problem involving six farms irrigating six different crops, and receiving different proportions of a total available water supply during 14 intervals in an irrigation season. Results showed the impact on irrigated agriculture of variations in water supply over the season and the importance of the operating procedure used to distribute water. (Kriss-Cornell)
W71-06581

STOCHASTIC DYNAMIC PROGRAMMING FOR OPTIMUM RESERVOIR OPERATION,
Texas Univ., Austin, Center for Research in Water Resources.
For primary bibliographic entry see Field 04A.
W71-06582

OPTIMIZATION IN DESIGN OF HYDRAULIC NETWORK,
Bengal Engineering Coll., Howrah (India). Dept. of Civil Engineering.
Arun K. Deb, and Asok K. Sarkar.
Journal of the Sanitary Engineering Division, ASCE, Vol 97, No SA 2, p 141-159, April 1971. 19 p, 9 fig, 12 ref, 2 append.

Descriptors: *Optimization, *Hydraulic systems, *Network design, *Digital computers, *Mathematical models, *Pipelines, Economics, Costs, Head loss, Pressure head, Water distribution (Applied).
Identifiers: *Equivalent diameters.

An equivalent diameter method for the economical analysis of a pipe network incorporating various cost functions was developed. A relationship between head loss in a pipe and flow through it was given by the Hazen-Williams formula. All branches of network pipes were replaced by equal lengths of equivalent diameter pipes in all loops so that minimum cost was obtained. A correction factor was derived which was algebraically added successively to the assumed flow values resulting in convergence of the assumed flow values towards the solution. A water distribution system consisting of pumps, an overhead service reservoir, and pipe networks was considered for optimization. The effects of the variation of inlet hydraulic head and geometry of the pressure surface on the total cost of the network were studied. The optimal solution was obtained through a digital computer program developed to calculate equivalent diameters and then actual diameters of all pipelines, and total cost of pipelines, the cost of elevated service reservoirs, the initial cost of pumps, and recurring costs using various cost functions. Total cost of a pipe network was dependent on both pressure surface geometry and the inlet pressure head. The cost functions used here were valid for the Calcutta area only but the method could be used in other areas. (Kriss-Cornell)
W71-06583

DYNAMIC MODELING OF STREAM QUALITY BY INVARIANT IMBEDDING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05G.
W71-06587

THE EFFECT OF SELECTED HYDROLOGIC VARIABLES ON STREAM SALINITY,
Agricultural Research Service, Chickasha, Okla.
H. B. Pionke, and A. D. Nicks.
Bulletin of the International Association of Scientific Hydrology, Vol XV, No 4, p 13-21, December 1971. 9 p, 5 fig, 4 tab, 7 ref.

Descriptors: *Hydrologic aspects, *Salinity, *Stream improvement, *Statistical methods, *Optimization, Streamflow, Watersheds (Basins), Monthly, Precipitation, Agriculture, Rain gages.
Identifiers: Antecedent conditions.

A relationship of hydrologic variables with stream salinity was determined statistically for two ephemeral streams, West Bitter Creek and Beaver Creek watershed, located in western Oklahoma. The hydrologic variables employed, composited on a monthly basis, were measures of average streamflow, precipitation, antecedent conditions, and agricultural land use. The statistical methods employed for evaluating the data included simple correlation, multiple regression, factor analysis, and optimization techniques performed by statistical package programs on an electronic computer. For both watersheds, nearly all variables describing the frequency of occurrence and the amount of precipitation were highly correlated with downstream salinity. Among these, the correlation was best for the relationship of maximum daily P with the salinity of West Bitter Creek Conversely, nearly all variables designating location or characteristics of rain gage zone receiving the maximum P for the month were not significantly correlated with stream salinity. The variables describing antecedent conditions except for salinity, did not correlate well with stream salinity. Data from both watersheds were subjected to factor analysis and those variables closely associated with stream salinity were incorporated into multiple regression equations. In comparing the two streams, West Bitter Creek, having the most intensive rain gage network, produced the best prediction equation. (Kriss-Cornell)
W71-06588

A DIGITAL MODEL FOR SIMULATING SEDIMENT MOVEMENT IN A SHALLOW RESERVOIR,
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.
William A. Thomas.
In: Proceedings of a Seminar on Sediment Transport in Rivers and Reservoirs, Corps of Engineers Hydrologic Engineering Center, April 7-9, 1970, Davis, California, Paper No 13, 1970. 10 p, 5 ref, 9 plate, append.

Descriptors: *Mathematical models, *Sediment transport, *Reservoir silting, Computer programs, Bed load, Scour, Suspended load, Deposition (Sediments), Sedimentation, Sediment load, Discharge (Water), Stage discharge relations, Backwater, Profiles.
Identifiers: *Ozark Reservoir (Ark).

The Ozark Reservoir is on the Arkansas River near Ozark, Arkansas. It is about 36 miles long and 45 feet deep at Ozark Dam. During periods of low flow this run-of-river reservoir, which supplies hydroelectric power and depth for navigation, will be contained within the river channel. However, the river will overflow the channel during floods. To determine real estate requirements for the reservoir it is necessary to know the volume of future sediment deposits, the location of these deposits, and the effect on water surface profiles in the reservoir. A time-sequence digital model was developed to relate the hydraulic characteristics of flow, the sediment transport capacity and the co servation of material in successive reaches of t reservoir. The order of computations is backwat sediment transport capacity, volume of sediment a reach, and resulting bed elevation. In succeedi reaches the depth of deposits at the upstream end the same as that calculated for the downstream e of the previous reach, and the resulting bed prof is continuous through the reservoir. (See also W7 06675) (Knapp-USGS)
W71-06684

NATURAL RESOURCES PROTECTION STUD
Metropolitan Council of the Twin Cities, Minn.

Available from NTIS as PB-196 142, $3.00 paper copy, $0.95 in microfiche. Report to T Metropolitan Council of the Twin Cities Area, N 1970. 115 p, 61 ref.
Identifiers: *Natural resources, Protection, *A ports, Regional planning, *Regional plannin *Minnesota, Environments, Vulnerability, Wat pollution, Groundwater, Surface waters, Soi Vegetation, Forest land, Air pollution, Fishe Birds, Zoning.

The study evaluates environmental factors a potential development characteristics to determi actions which are required to protect natur resources. The areas evaluated are the airpo development areas for alternate major airport sit at Ham Lake and Rosemount, Minnesota. The areas are studied due to the applicability of regul tions in conformance with the Minnesota Airpo Zoning Act of 1969. However, a universal set factors has been considered, so that the findings a equally applicable for any area within the region.
W71-06780

A HYDROLOGIC MODEL OF THE BEA RIVER BASIN,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 04A.
W71-07056

6B. Evaluation Process

WATER FOR INDUSTRIAL DEVELOPMENT I AMITE, FRANKLIN, LINCOLN, PIKE, AN WILKINSON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Wate Resources Div.
For primary bibliographic entry see Field 03E.
W71-06510

ALASKA-TEN YEAR COMPREHENSIVE PLA FOR CLIMATOLOGIC AND HYDROLOGI DATA.

Available from Alaska Power Admin., P.O. Box 5 Juneau, Alaska 99801. Alaska Inter-agenc Technical Committee Report, Third Editio November 1970. 98 p, 23 map, 20 photo, 18 tab.

Descriptors: *Water resources developmen *Long-term planning, *Alaska, *Climatic dat *Hydrologic data, Data collections, Surface water Groundwater, Hydrology, Geology, Estuaries, Pro grams, Project planning, History, Costs, Soils, So moisture, Temperature, Precipitation (Atmosphe ic), Instrumentation, Network design, Stream Lakes, Aquifers.
Identifiers: Water and climate data syste (Alaska).

This report projects needs for water and climate in formation systems in Alaska during the 1970's, an outlines programs that would fill these needs. Th programs concentrate in areas of greatest need--i and near Alaska cities and towns and in the areas o expanding industry and resource extraction. Th programs also seek to establish minimum network type coverage for inventorying and monitoring th water and climate resources. The program

spond to an outlook for broad expansion of the aska economy and for a substantial population crease in the 1970's. They reflect the new de- nds accompanying developments in previously mote parts of the state. They reflect the growing ncern and need for information about the Alaska vironment. Some of the proposals involve sub- ntial program increases. All involve a great deal original work--data collection and studies that ve not been done before. Estimated costs for the oposed programs are summarized. The costs in- de installation, operation and maintenance for oposed new activities, all on the basis of 1970 ces. (Woodard-USGS)
71-06521

IE POLITICS OF WATER RESOURCE ANAGEMENT THROUGH ARIZONA ATER-RELATED REGULATORY AGENCIES,
izona Univ., Tucson. Dept. of Government.
r primary bibliographic entry see Field 06E.
71-06618

PRAISAL OF THE WATER AND RELATED ND RESOURCES OF OKLAHOMA.
klahoma Water Resources Board Publication 34, gion 8, March 1971. 141 p.

escriptors: *Water resources development, *Sur- ce waters, *Groundwater, *Oklahoma, ydrologic data, Planning, Projects, Evaluation, ater supply, Water yield, Water quality, Water lization, Consumptive use, Hydrogeology, eteorological data, Climatology, Watershed nagement, Streams.
entifiers: *Water resources (Central Oklahoma).

e Oklahoma Water Resources Board, with the sistance of other agencies and individuals, is for- ulating a long-range comprehensive water plan r Oklahoma. This report (Region VIII) the venth in a series called 'Appraisal of the Water d Related Land Resources of Oklahoma,' is part the first step in gathering information basic to s plan for the State's future water prosperity. Re- on VIII contains not only the geographical center the State but also a center of population and in- stry. The Water Resources Council has pre- cted that within the next 20 years the population the stream basin system including Region VII ll increase by about 36% of the 1970 total, and at personal income in this area will increase 2.5 nes over its current rate, primarily as a result of a edicted 36% increase in manufacturing. Extend- g the Arkansas River Navigation Project up Deep rk to Arcadia, as has been projected, would hance the projection for increased industry. In a rmal year of 31-inch precipitation, about 225,000 acre-feet of runoff is generated in Re- on VIII. However, only a small percentage of the nount can actually be developed. Suitable dam es are usually located in areas where water needs e not great. Importing surplus water from outside e basin to meet the growing demand is discussed. Woodard-USGS)
71-06673

ATER RESEARCH.
r primary bibliographic entry see Field 02A.
71-06759

AJOR RESEARCH PROBLEMS IN YDROLOGY AND ENGINEERING,
r primary bibliographic entry see Field 02A.
71-06760

ORT SMITH URBANIZING AREA: WATER, EWER AND STORM DRAINAGE PLAN, OLUME I, WATER.
r primary bibliographic entry see Field 04A.
71-06775

ECONOMIC ASPECTS OF OCEAN ACTIVITIES. VOLUME II. ECONOMIC FACTORS IN THE DEVELOPMENT OF A COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge.
A. H. Keil.
Available from NTIS as PB-195 224, $3.00 in paper copy, $0.95 in microfiche. Report No MSC-71-67, Cambridge, Mass, Sep 70. 183 p, 123 p with append.

Descriptors: *Coasts, *Nuclear power plants, Beaches, *Urbanization, *Recreation facilities, Planning, Economic feasibility, Cost analysis, Maine government finance.
Identifiers: *Refineries, Urban planning, *Boston harbor.

The core of this Report outlines the economics of the coastal zone in the abstract, defines the concept of economic efficiency, points out the mechanisms by which the private market can fail to allocate the coastal zone efficiently, introduces the concept of parochial benefits, outlines how local control can sometimes operate to produce allocations which are more inefficient than the private market, considers problems introduced by the fact that a decision-making body can almost never predict the future with certainty, and introduces techniques for incorporating this uncertainty into cost-benefit analysis. The practical problems, as well as the limitations, involved in the application of cost-benefit analysis to the coastal zone are explored in some detail in four specific examples: (1) The provision of a recreation facility in Boston Harbor; (2) The redevelopment of the coastal town of Hull, Massachusetts; (3) The location of a nuclear power plant near Plymouth, Massachusetts; and (4) The establishment and location of a refinery complex in Maine and the associated oil distribution problem.
W71-06776

NATURAL RESOURCES PROTECTION STUDY.
Metropolitan Council of the Twin Cities, Minn.
For primary bibliographic entry see Field 06A.
W71-06780

WATER AND SEWERAGE FACILITIES PLANNING PROGRAM FOR MADISON, ST. CLAIR AND MONROE COUNTIES, ILLINOIS. PHASE I-PROGRAM DESIGN.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.

Available from NTIS as PB-195 456, $3.00 in paper copy, $0.95 in microfiche. May 1970. 117 p, 7 fig, 13 ref. HUD Project Ill 9-275.
Identifiers: *Regional planning, *Illinois, *Water supply, Regional planning, *Sewers, Regional planning, Project planning, Expenses, Financial management, *Madison County (Ill), *Monroe County (Ill), *Saint Clair County (Ill).

Planning goals and objectives; Planning Program design; Administration considerations; Financing considerations; and Construction priorities.
W71-06794

CLARKSVILLE-MONTGOMERY COUNTY WATER AND SEWERAGE FACILITIES. A COMPREHENSIVE ANALYSIS, PLAN, AND PROGRAM TO 1989, WATER AND SEWER STUDY.
Clarksville-Montgomery County Regional Planning Commission, Tenn.
For primary bibliographic entry see Field 06D.
W71-06802

PROCEEDINGS OF FARM ANIMAL WASTE AND BY-PRODUCT MANAGEMENT CONFERENCE.
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05G.
W71-06810

IMPROVEMENT OF HYDRO-ELECTRIC SCHEMES BY HYDROMECHANICAL INVESTIGATIONS AND SCALE MODEL EXPERIMENTS,
Karlsruhe Univ. (West Germany).
E. F. Mosonyi.
Paper DUB/SYMP/EP/B.3, Economic Commission for Europe Committee on Electric Power Symposium on Prospects for Developing Hydro-Electric Schemes and Their Incorporation in Future Energy Supply Systems, Dubrovnik, Yugoslavia, Oct 1970. 13 p, 22 ref.

Descriptors: Project planning, *Hydroelectric power, Hydroelectric powerplants, *Hydroelectric resources, Investigations, Technology, Surge waves, Hydraulic turbines, Pumped storage, Turbine efficiency, Foreign research, Hydraulic machinery, Model studies, Hydraulic design, Research and development, Bibliographies, Operating costs, Cavitation.
Identifiers: German Federal Republic, Hydroelectric power surveys.

Future programs of water power development will utilize less advantageous power sites after the best possible sites have been developed to their fullest extent. Progress in research and technology may open many of the less favorable sites in the future. Some important achievements and trends in technological progress leading to economic development of less favorable hydropower sites are listed. The aspects of improvement by hydromechanical investigations and scale model experiments discussed include: (1) low-head plants, (2) surge control, (3) high-head plants, (4) pumped storage, and (5) improvements in hydraulic machinery. Hydromechanical research may be the major contributor to hydroscheme improvements. Theoretical studies, scale model experiments, and field measurements should be investigated for further improvements in hydropower developments. (USBR)
W71-06845

NEW INFORMATION NEEDS FOR WATER MANAGEMENT IN URBAN REGIONS,
For primary bibliographic entry see Field 05G.
W71-06896

CENTRAL NEW YORK REGION WATER RESOURCES: DATA INVENTORY AND EVALUATION.
Central New York Regional Planning and Development Board, Syracuse.

Available from NTIS as PB-195 008, $3.00 in paper copy, $0.95 in microfiche. Technical memo, TM-3, Jan 1970. 16 p. HUD Project No NYP-160.
Identifiers: *Regional planning, *New York, *Water resources, Regional planning, Land use, Project planning, Documents.

The report describes the planning efforts, with respect to water resources and related land use of the Central New York Regional Planning and Development Board to January, 1970. Included in the memorandum are a water resources data inventory and an evaluation of the data available. The evaluation section details the organization for water resources planning, the Program for Cooperative Study employed by the River Basin Boards, the progress of this program, and liaison and coordination efforts which are or should be pursued by water resources planners and the Regional Planning Board for their mutual benefit.
W71-06939

PILOT-PLANT STUDIES OF PROCESSING WASTES OF COTTON TEXTILES,
For primary bibliographic entry see Field 05D.
W71-06993

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

CONCERNING THE ECONOMIC VALUE OF EXPERIMENTATION IN THE DESIGN OF DESALTING PLANTS,
Department of Commerce, Washington, D.C.
For primary bibliographic entry see Field 03A.
W71-06590

HANDBOOK OF STEEL DRAINAGE CONSTRUCTION PRODUCTS: CHAPTER 15 - COST FACTOR.
For primary bibliographic entry see Field 08A.
W71-06644

FINANCING CONSTRUCTION OF A MAJOR DRAINAGE IMPROVEMENT,
For primary bibliographic entry see Field 04A.
W71-06652

EFFECT OF RESEARCH ON PRESENT DRILLING COSTS,
American Association of Oil Well Drilling Contractors, Dallas, Tex.
For primary bibliographic entry see Field 08A.
W71-06958

6D. Water Demand

WATER FOR INDUSTRIAL DEVELOPMENT IN AMITE, FRANKLIN, LINCOLN, PIKE, AND WILKINSON COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 03E.
W71-06510

A SIMULATION OF IRRIGATION SYSTEMS--THE EFFECT OF WATER SUPPLY AND OPERATING RULES ON PRODUCTION AND INCOME ON IRRIGATED FARMS,
Economic Research Service, Fort Collins, Colo. Natural Resource Economics Div.
For primary bibliographic entry see Field 06A.
W71-06581

WATER SUPPLY AND DEMAND,
Cornell Univ., Ithaca, N.Y.
L. Michael Falkson.
Available from NTIS as PB-198 306, $3.00 in paper copy, $0.95 in microfiche. Technical Report 22, June 1970. 10 p. OWRR Project A-001-NY (11).

Descriptors: *Water supply, *Water demand, *Industrial water, Water shortage, Pricing, Recreation, Statistical methods, *Regions, Water utilization, Water allocation, Irrigation efficiency, Economics.
Identifiers: *Microeconomic analysis, Applied welfare economics.

This is a report concerning some activities and accomplishments at Cornell University through the Water Supply-Demand Project from 1965 to 1969. A brief summary of each year's accomplishments was given. Several new developed courses related to water resources economic were listed. Some of the major research tasks completed by the project were presented. Important research topics in 1966, 67 and 68 included 'The Allocation of Regional Water Supplies: A Case Study of the Northeastern United States,' 'The relationship between water shortages and pricing policies of water supply system,' and some subjects on the demand for water in the fields of irrigation and outdoor recreation. For the fiscal year 1969, the major research activity reported was a statistical analysis of regional variations in industrial water use in the United States to determine if there existed significant regional variations in industrial water use technology as measured by the ratio of water use to value added or water use to value of shipments. A complete description of this analysis made up the bulk of the report. (Wang-Rutgers)
W71-06598

COOLING WATER SOURCES FOR POWER GENERATION,
Westinghouse Electric Corp., East Pittsburgh, Pa. Power Systems Planning.
For primary bibliographic entry see Field 05G.
W71-06671

CLARKSVILLE-MONTGOMERY COUNTY WATER AND SEWERAGE FACILITIES. A COMPREHENSIVE ANALYSIS, PLAN, AND PROGRAM TO 1989, WATER AND SEWER STUDY.
Clarksville-Montgomery County Regional Planning Commission, Tenn.

Available from NTIS as PB-195 414, $3.00 in paper copy, $0.95 in microfiche. Report to the Clarksville-Montgomery County Regional Planning Commission, Tenn, May 1970. 109 p. HUD Project Tenn P-60.

Descriptors: *Regional analysis, *Water supply, *Sewers, Financing, Land use, Population, Economic feasibility.
Identifiers: *Regional planning, Regional planning, *Montgomery County, Tennessee, *Clarksville, Tennessee.

The study includes an immediate (5-10 year) and long-range (20-year) water and sewer plan. The area covered is the entire County for water and a 100 square mile urbanizing area, excluding Fort Campbell, for sanitary sewers. Proposals are made for solving immediate problems while indicating needs for the next 20 years.
W71-06802

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Center, Philadelphia, Pennsylvania.
For primary bibliographic entry see Field 03B.
W71-06933

FUTURE DEMANDS ON GROUNDWATER IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
Richard J. Schicht, and Allen F. Moench.
Groundwater, Vol 9, No 2, p 21-28, March-April 1971. 8 p, 7 fig, 3 tab, 11 ref.

Descriptors: *Water demand, *Water resources development, *Groundwater, *Illinois, Water balance, Urbanization, Cities, Withdrawal, Water utilization, Water yield, Recharge, Water sources, Lake Michigan.
Identifiers: *Urban water supply, *Chicago (Illinois).

Future water demands were estimated for each 10-year interval from 1980 to 2020 for areas in the Chicago region dependent upon groundwater as a source of supply. Demands were compared with groundwater availability to define water deficient areas. Two approaches were considered in developing the groundwater resource. The first approach limits groundwater withdrawals to the maximum rate of natural groundwater recharge that can be induced by pumping. The second approach allows withdrawals to exceed natural recharge. When limiting groundwater withdrawals to recharge a large part of the region will require importation of water by as early as 1980. With proper pumpage distribution it is conceivable that there is sufficient water that can be withdrawn (mined) in excess of natural recharge to meet demands through the year 2020. (Knapp-USGS)
W71-07004

6E. Water Law and Institutions

LEGAL ASPECTS OF WATER SUPPLY AND WATER QUALITY STORAGE,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 05G.
W71-06506

GUILFORD AND SANGERVILLE WATER DIST V SANGERVILLE WATER SUPPLY CO (POWER OF PUBLIC UTILITIES TO SELL THEIR PROPERTY).

154 A 567-569 (Me 1931).

Descriptors: *Maine, *Contracts, *Remedies, *Public utilities, Public utility districts, Water supply, Water rights, Land tenure, Public rights, Legislation, Judicial decisions, Legal aspects, Administrative agencies, Watercourses (Legal), Reservoirs, Pipes, Conduits, Costs, Eminent domain.

Plaintiff water district sought specific performance of contracts by which defendant water utility companies agreed to sell their works to plaintiff. In one contract the utility's predecessor promised the town or water district, if one was created, that one or the other might acquire the waterworks anytime after installation. In the second contract the legislative charter for the water company provided that the town or water district, if one was created, might purchase ten years after construction. The Supreme Judicial Court of Maine dismissed both bills. In the first contract, the water company had succeeded to the duties under the contract. However, such corporations are quasi-public and may not, without legislative consent, deal with its property in such a way as to incapacitate itself from performing its public duties. The proposal to sell the water system went beyond defendant's corporate power. As to the second contract the legislature, exercising its right to revoke its authorization of sale, amended its original act, enlarging the water district and repealing the provision respecting sale and purchase under the contract offer. (Duss-Florida)
W71-06526

REUTER V MILAN WATER CO (RIGHT OF WATER COMPANY TO CONDEMN LAND FOR WATER SUPPLY PURPOSES).
198 NE 442-444 (Ind 1935).

Descriptors: *Indiana, *Eminent domain, *Condemnation, *Water supply, Wells, Construction, Lakes, Streams, Subsurface waters, Reservoirs, Cities, Domestic water, Land, Legislation, Judicial decisions, Legal aspects, Right-of-way, Administrative agencies, Public utilities.

Plaintiff water company sought to condemn defendants' lands for the purpose of providing a town's water supply. The projected water supply was to be pumped from beneath defendants' lands. Defendants objected on several grounds, including: (1) that there was no statutory authority giving a private corporation the right of eminent domain; (2) that condemnation of land for the procurement of water where the source was a surface body of water could be distinguished from condemnation of land where the source was underground, and (3) that there was no basis for determining the amount of water to be taken. The trial court overruled defendants' objections and the Supreme Court of Indiana affirmed. A specific legislative act empowers corporations organized and authorized to furnish water to the public or towns to condemn land to carry out such purpose. There is no distinction

between condemning land with surface water sources and that with subsurface water sources. Determination of the amount of water taken and its value is an issue of fact to be determined upon the report of the appraisers. (Duss-Florida)
W71-06531

ANCONA REALTY CO V FRAZIER (OWNERSHIP OF ACCRETED ISLAND).
41 SW2d 820-824 (Mo 1931).

Descriptors: *Missouri, *Accretion (Legal aspects), *Legislation, *Land tenure, Real property, Boundaries (Property), Boundary disputes, Islands, State governments, Riparian land, Rivers, Missouri River, Legal aspects, Judicial decisions, Prescriptive rights.

Plaintiff realty company brought action to quiet title to island land claimed by defendant landowner. Defendant asserted that he held title to the disputed land by accretion to his riparian tract, which was also accreted land. By statute, title to all accreted land had been vested in the county; the statute also provided a 20-year moratorium for adverse possession against the county on these accretions. The disputed accretion had occurred during the moratorium. Since plaintiff's tract had been owned by the county at the time of the accretion by virtue of the statute, the Supreme Court of Missouri held that defendant could not have acquired title by accretion. Defendant further asserted title by patent from the county; however, the description of his land did not include the disputed land. The court held that since alluvion or batture with sufficient elevation to be privately owned did not pass with other land unless expressly conveyed in the patent, defendant did not have title by patent. Accordingly, the lower court decision for plaintiff was affirmed. (Hart-Florida)
W71-06554

VAUGHAN V VIRGINIA ELECTRIC AND POWER COMPANY (AUTHORITY TO ISSUE DAM PERMITS FOR NON-HYDROELECTRIC PURPOSES).
178 SE2d 682-684 (Va 1971).

Descriptors: *Virginia, *Dams, *Electric power production, *Watercourses (Legal), Legal aspects, Judicial decisions, Hydroelectric project licensing, Hydroelectric power, Nuclear power plants, Nuclear reactors, Nuclear energy, Cooling water, Cooling, Electric power industry, Electrical networks, Transmission lines, Damsites, Ponding, Rivers, River flow, Land tenure, Real property, Permits, Legislation, Interstate.

Intervening landowners sought to contest the state's grant of a license to dam a river to create a cooling reservoir for a nuclear powerplant. The impounded waters were to be used for cooling purposes only. The intervening landowners contended that the State Corporation Commission was not authorized to issue dam construction permits for non-hydroelectric purposes. The Virginia Supreme Court of Appeals held that the State Corporation Commission was authorized to issue damming permits where the power to be generated by a nuclear plant would flow through interstate transmission lines. Under statutes there were two classes of water: (1) 'water within the state', for which only hydroelectric dam permits could be issued; and (2) 'waters of the state', which included waters the damming of which would affect interstate or foreign commerce. The licensing of any dam was authorized for 'waters of the state'. Noting that the nuclear plant would transmit power over interstate lines, the court affirmed the Commission's order issuing the license and conceding a lack of jurisdiction over related property interests. (Earl-Florida)
W71-06568

MOARATTY V TOWN OF HAMPTON (MUNICIPAL LIABILITY FOR STORM DRAIN OVERFLOW).
272 A2d 606-608 (NH 1970).

Descriptors: *New Hampshire, *Local governments, *Flood damage, *Drainage systems, Floods, Floodwater, Legal aspects, Damages, Land tenure, Drains, Drainage effects, Drainage water, Surface waters, Compensation, Judicial decisions, Cities, Storms, Precipitation (Atmospheric), Storm runoff, Cloudbursts, Storm drains, Surface runoff, Intakes, Adjudication procedure.

Plaintiff landowner brought action for property damage resulting from flooding when defendant town's drainage system overflowed. Heavy precipitation preceded the flooding. Plaintiff claimed defendant was negligent in maintaining the system. Defendant asserted that the precipitation was an act of God which overtaxed the system. Defendant contested a jury verdict in favor of plaintiff and the trial court's denial of his motions for nonsuit and directed verdict. The Supreme Court of New Hampshire held that a property owner is not entitled to recover for flood damage resulting from drainage system overflow unless the town's negligence in performing maintenance, or the existence of obstructions within the system, is first established. The court ruled that defendant's negligence could not be inferred from the mere fact of injury to plaintiff's property. Finding no evidence of either an obstruction within the system or negligence, the court held defendant's motions should have been granted. (Earl-Florida)
W71-06584

ARNOLD'S INN, INC V MORGAN (REQUIRED REMOVAL OF OBSTACLES TO RIPARIAN ACCESS).
317 NYS2d 989-991 (Sup Ct 1970).

Descriptors: *New York, *Riparian rights, *Damages, *Access routes, Riparian land, Relative rights, Riparian waters, Navigable waters, State jurisdiction, Real property, Land tenure, Legal aspects, Judicial decisions, Adjudication procedure, Local governments, Right-of-way, Water rights.

Plaintiff riparian owner brought action to compel the removal of rubble and other objects placed on his shoreline by defendant neighboring property owner. Plaintiff contended that such objects restricted his right of access to a navigable tidal bay. Plaintiff failed to establish any damages. Defendant alleged slander of title. Cross claiming township sought an injunction barring defendant's trespass and requiring him to remove certain structures. Plaintiff and defendant appealed lower court's judgment granting township's cross claim but dismissing plaintiff's claim and defendant's counterclaim. The New York Supreme Court held that a riparian owner is entitled to the removal of obstacles restricting his right of direct access to riparian waters notwithstanding the fact that such riparian owner fails to establish resulting damages. Judgment was affirmed insofar as it related to the township's right to injunctive relief. Judgment was modified in respect to plaintiff's claim, and defendant was directed to remove the objects complained of which restricted his direct access to riparian waters. (Earl-Florida)
W71-06589

ROBICHAUX V THERIOT (PROOF OF NAVIGABILITY AS A PREREQUISITE FOR APPLYING ADMIRALTY LAW).
242 So2d 644-646 (La Ct App 1970).

Descriptors: *Louisiana, *Navigation, *Admiralty, *Boating, Boats, Canals, Damages, Recreation, Risks, Adjudication procedure, Navigable waters, Non-navigable waters, Bodies of water, Accidents, Insurance, Legal aspects, Judicial decisions.

Plaintiff boat passenger sought compensation from defendant boat operators and their insurers for injuries sustained in the collision of two pleasure boats. The collision occurred at dusk in the narrow channel of a fifty foot wide canal. No evidence of the canal's navigability was introduced at trial. Plaintiff claimed that the negligent operation of both boats caused his injuries. The trial court rendered judgment against both defendants. Averring that the canal was navigable, one insurer appealed, contending that the divided damages rule of admiralty prohibited solidary liability judgments. Appellant also contended that the award of $10,000 damages was excessive. The Louisiana Court of Appeals held that, absent prior proof of navigability, a canal cannot be presumed navigable for purposes of applying the divided damages rule of admiralty law. Finding both operators jointly and contributorily negligent, the court affirmed the lower court's solidary judgment against defendants. In light of plaintiff's injuries the award was ruled not excessive. (Earl-Florida)
W71-06591

YEOMAN V KANSAS CITY (MUNICIPALITY'S LIABILITY FOR INSTALLATION OF CULVERT AND ALTERING FLOW OF STREAM).
18 SW2d 107-111 (Kansas City Ct App 1929).

Descriptors: *Missouri, *Cities, *Floods, *Overflow, Streams, Culverts, Storm runoff, Storm drains, Surface waters, Surface runoff, Roads, Natural flow doctrine, Alteration of flow, Streamflow, Riparian rights, Surface drainage, Legal aspects, Judicial decisions.

Plaintiff riparian landowner sued defendant municipality for damages resulting from overflow of the creek in front of plaintiff's property. Plaintiff asserted that defendant had negligently installed a culvert and altered the flow of the creek. Before the culvert was installed the creek had never overflowed onto plaintiff's land. Defendant answered that the damage was the result of extraordinary rainfall. At trial, verdict was given for defendant. Plaintiff moved for a new trial, alleging that the verdict was against the weight of the evidence. Although the Kansas City Court of Appeals determined that the evidence failed to show that the culvert ipso facto caused the overflow, it found that the evidence demonstrated that defendant's raising of a street downstream had caused the overflow. In granting plaintiff's motion for a new trial, the court stated that it was no defense for defendant to answer that its actions were a governmental function, performed in good faith. (Hart-Florida)
W71-06592

HOGGE V DRAINAGE DIST NO 7 (DRAINAGE DISTRICT'S LIABILITY FOR FLOODING LAND OUTSIDE DISTRICT).
26 SW2d 887-891 (Ark 1930).

Descriptors: *Arkansas, *Drainage districts, *Flooding, *Remedies, Flood damage, Submergence, Overflow, Design flood, Maximum probable flood, Administrative agencies, Eminent domain, Condemnation, Damages, Compensation, Real property, Crops, Drainage, Reservoir, Remedies.

Plaintiff landowner sued defendant drainage district for damages caused by overflow of plaintiff's land. Defendant's construction of a reservoir caused water to overflow plaintiff's land, which was located outside the drainage district. Defendant contended that since plaintiff's property was located outside the district, defendant was not liable. However, the Supreme Court of Arkansas stated five propositions in holding that the lower court improperly sustained defendant's demurrer: (1) obstructing a stream, causing overflow, is a compensable injury; (2) the natural flow of water cannot be changed for the benefit of one class and to the detriment of another without compensation; (3) if a drainage district takes land, compensation must be effected before appropriation; (4) if a district concedes that damage will result from improvements, damages may be assessed by eminent domain proceedings or an action for trespass; and (5) if damages are not conceded, an action for damages may be brought when the improvement is constructed. It makes no difference that damaged property is outside the drainage district whose actions resulted in the injury. Since the demurrer ad-

mitted plaintiff's allegations, and the injury was permanent, defendant was held liable. (Hart-Florida)
W71-06593

REID V ROSS (RIPARIAN OWNER SUBJECT TO FISH AND GAME REGULATIONS).
46 SW2d 567-569 (Mo 1932).

Descriptors: *Missouri, *Fishing, *Lakes, *Legislation, State governments, *Missouri River, Navigable rivers, River beds, Riparian land, Riparian rights, Legal aspects, Judicial decisions.

Plaintiff riparian owner sought to enjoin defendant fish and game commissioner from interfering with her fishing rights. A lake had been formed in the river bed when the Missouri River changed its course; part of this lake was owned by plaintiff. Plaintiff seined the lake commercially, and defendant arrested her agents for violation of fish and game law. The applicable statute proclaimed that fishing in 'any of the waters of this state' was unlawful except as permitted by law. However, these restrictions were not applicable to private ponds and artificially propagated fish held in captivity. It was determined that plaintiff's circumstances were not within either of these exceptions. The Supreme Court of Missouri noted that the lake formed in the river bed was private with respect to the riparian fishing right, but that this right was subject to state regulation. Hence, the statute was held to prohibit commercial seining in the lake, and the injunction was denied. (Hart-Florida)
W71-06594

WATER AND RELATED LAND RESOURCES - STATE ADMINISTRATION, LEGISLATIVE PROCESS AND POLICIES IN MINNESOTA, 1970,
Minnesota Univ., Minneapolis.
William C. Walton, and David L. Hills.
Available from NTIS as PB-198 307, $3.00 in paper copy, $0.95 in microfiche. Bulletin No 27, Jan 1971. 344 p, 19 fig, 18 tab. OWRR Project A-021-MINN (1).

Descriptors: *Minnesota, *Water resources, *Water policy, *Administration, Administrative agencies, Legislation, Water conservation, Water pollution, Water pollution control, Planning, Coordination, Land resources, Natural resources, Conservation, Environment, Public health, Water rights, Public rights, Federal government, Government finance, Legal aspects, Water resources development, History, Financing.

The first of a three-part report on water resources administration in Minnesota, this bulletin contains information on state water and related land resources administration, legislative progress, and policies as of 1970. The bulletin initially summarizes the state administrative structure and gives detailed data on the operation of such state agencies as the Department of Conservation, the Pollution Control Agency, the Soil and Water Conservation Commission, the Water Resources Board, the State Board of Health, and the State Planning Agency. It recommends reorganization of state regulatory agencies to better coordinate various agency activities. Included is a reorganization plan consisting of a consolidation of major administrative functions within a single agency, creation of an environmental council and environmental quality commission, and a broadening of the duties of the Minnesota Resources Commission. The bulletin reviews measures relating to water resources introduced in the legislature during the 1969 session. Here it discusses the Minnesota Resources Commission, which serves as a research facility for the legislature. The bulletin ends with a discussion of state water policies and the need for a comprehensive state environmental policy. The National Environmental Policy Act of 1970 is included, as is a list of proposed state legislative actions. (Duss-Florida)
W71-06599

ENVIRONMENTAL LAW HANDBOOK,
For primary bibliographic entry see Field 05G.
W71-06600

PUBLIC LAND POLICY AND THE ENVIRONMENT, VOLUME 3, PART II: ENVIRONMENTAL PROBLEMS ON THE PUBLIC LANDS. CASE STUDIES 9 THROUGH 17,
Rocky Mountain Center on Environment, Denver, Colo.
Rudolf W. Becking, and G. Lloyd Hayes.
Available from NTIS, AS PB-196 170, $3.00 in hard copy, $0.95 in microfiche. Rocky Mountain Center on Environment, Denver, Colorado, December 1970. 837 p, 18 fig, 16 illus, 125 photos, 19 tab, 413 ref, 21 append.

Descriptors: *Public lands, *Land use, *Environmental effects, *Land management, National parks, Pollution abatement, National recreation areas, Water management (Applied), Natural resources, Federal government, Legislation, Fisheries, Insect control, Wildlife habitats, Diseases, Water quality, Lumber, River basins, Oil, Dams, Recreation demand, Recreation, Highway effects, Transmission lines, Legal aspects.

Nine case studies are included in this volume, each of which discusses public land uses or management practices having environmental consequences. The case studies which include data collected and outside materials, discuss: (1) timber, fisheries, and water quality problems in a river basin in Oregon; (2) a review and analysis of four insect-disease control projects; (3) the Santa Barbara oil spill, including the history of oil legislation, judicial decisions, a recounting of events leading to the spill, the spill's environmental impact, the role of the federal government, and suggestions for future legal approaches; (4) the environmental impact of an interstate highway on a wildlife refuge in Alabama; (5) the impact of proposed dams on the Snake River in Idaho; (6) the impact of recreational use on the environment in Minnesota's canoe wilderness of the National Wilderness Preservation System and an appendix of the legal materials involved; (7) the impact of recreational use on the environment in Yosemite National Park; (8) off-road vehicular traffic as a threat to the environment; and (9) aesthetic coordination of transmission lines with the environment. The volume is replete with figures and illustrations and contains 21 appendices documenting the case-study material. (Smiljanich-Florida)
W71-06601

THE HUDSON RIVER BASIN.
League of women Voters Education Fund, Washington, DC, $0.50, 1969. 40 p.

Descriptors: *Hudson River, *River basin development, *Water pollution, *Interstate compacts, River basins, Navigable rivers, River basin commissions, Watersheds (Basins), Interstate commissions, Watershed management, Legal aspects, Delaware River Basin Commission, Pollution abatement, Water pollution control, Water pollution treatment, Water management (Applied).

Land and water use in the Hudson River Basin is the subject of this report. Part I of six parts discusses the 'Challenge on the Hudson', stressing the difficulty of mobilizing an effort to prevent man from destroying nature. In part II, entitled 'Facts and Trends', the upper and lower Hudson basins are examined separately. Part III examines demands on the water and land in six reports dealing with: (1) agriculture; (2) industry; (3) housing; (4) highways; (5) conservation; and (6) water storage. 'Are the Challenges Being Met' is the title of part IV; it examines: (1) the pure waters program; (2) water supply planning; (3) administrative systems for planning and implementation of water policy, including the Delaware River Basin Example and the 'Interstate-Federal Compact for the Hudson'; and (4) the Hudson River Valley Commission. Part V is entitled 'Basin Miniatures' and discusses the Herkimer-Oneida Counties Comprehensive Planning Program in New York. The final part relates methods of obtaining support for a pollution control project from the local government. (Hart-Florida)
W71-06602

LAW OF WATER RESOURCES OF THE STATE OF MISSISSIPPI: A MULTIFACTORAL, POLICY-ORIENTED STUDY OF LEGAL PRESCRIPTIONS RELATING TO WATER USE AND CONTROL,
Mississippi Water Resources Research Inst., Oxford.
P. Williams, and W. Holder.
Technical Report, Project No 6, June 30, 1966. 23 p, 80 ref.

Descriptors: *Mississippi, *Water resources, *Federal-state water rights conflicts, Water control, Water law, Watercourses (Legal), Artificial watercourses, Natural, Streams, State governments, Mississippi River, Boundaries (Property), Boundary disputes, Water resources development, Legal aspects, United States, Federal government, Regulation, Legislation, Judicial decisions, Water policy.

The objectives of this study were: to determine the problems created by conflicting claims to water use and control in Mississippi; to explore how these conflicting interests have been protected by legislative act, judicial decision, and administrative regulations; and to formulate recommendations for legislation. The research was conducted in three phases, the first phase analyzing legal problems relating to the Mississippi Sound. The Sound was considered important because of conflicting claims of three states and the United States to control its water resources. Delineation of the Mississippi state boundary was necessary to resolve the conflicts. Recommendations to resolve the boundary conflicts and to clarify the authority of the claimants to control the Sound were promulgated. The second phase of the study involved a comprehensive analysis of the law of natural watercourses within Mississippi and included an examination of the legal rights of riparian owners, the status of natural watercourses as boundaries, and problems arising from obstruction of natural watercourses. The final phase examined the law of artificial watercourses, including the right to create and use artificial watercourses, and remedies available to aggrieved parties. (Hart-Florida)
W71-06603

PROTECTION AND ENHANCEMENT OF ENVIRONMENTAL QUALITY.
Federal Register, Vol 35, No 46, Saturday, March 7, 1970, p 4247-4248.

Descriptors: *Federal government, *Federal project policy, *Administrative agencies, *Balance of nature, Environment, Institutions, Institutional constraints, Adoption of practices, Coordination, Decision making, Leadership, Legislation, Multiple-purpose projects, Project planning, Administration, Administrative decisions, Non-structural alternatives, Integrated control measures, Environmental effects, Ecology.
Identifiers: *National Environmental Policy Act of 1969.

Measures to be taken by federal agencies and the Council on Environmental Quality in furtherance of the National Environmental Policy Act of 1969 are stipulated in this Order. Heads of agencies shall: (1) moniter and evaluate agency activities to protect environmental quality; (2) insure the adequacy of public information on programs having environmental impact; (3) insure that other governmental bodies and other interested institutions have access to information on environmental problems and control measures; and (4) identify inconsistencies between the National Environmental Protection Act of 1969 and agency jurisdiction, authority, or procedures. The Council on Environmental Quality shall: (1) evaluate and make recom-

mendations concerning federal policies and programs affecting environmental quality, (2) recommend priorities in environmental programs, (3) conduct hearings and conferences on significant environmental issues, (4) promote the development and use of environmental indexes and monitoring systems, (5) coordinate federal environmental programs, (6) foster research relating to environmental quality, and (7) advise and assist the President and federal agencies on international environmental efforts and in preparing the annual Environmental Quality Report. (Earl-Florida)
W71-06604

OUTDOOR RECREATION UNDER FEDERAL POWER ACT.

Federal Register, Vol 35, No 42, p 3993-3994, March 1970. 2 p.

Descriptors: *Administrative agencies, *Recreation, *Regulations, *Federal Power Act, Administrative decisions, Federal government, Federal project policy, Electric power industry, Electric powerplants, Facilities, Recreation facilities, Boating, Swimming, Water sports, Multiple-purpose projects, Safety, Recreation wastes.

The Federal Power Commission clarifies herein a statement of policy respecting outdoor recreational developments at projects licensed or to be licensed under the Federal Power Act. The previous statement of policy is amended to specify that the recreation facilities referred to are those maintained and operated by the licensee, and that the licensee is not expected to be an insurer or guarantor of the safety of visitors, but rather that reasonable measures and facilities be provided to enhance safe use and enjoyment of project lands and waters for recreational purposes. Measures required by the regulation include adequate vertical clearance under bridges and transmission lines, log-booms at spillways and powerhouses, warning systems, buoys, signals, signs, fencing, and sewage facilities. (Hart-Florida)
W71-06605

MORE ABOUT OYSTERS THAN YOU WANTED TO KNOW,
Garrett Power.
Maryland Law Review, Vol 30, No 3, p 199-225, Summer 1970. 27 p, 154 ref.

Descriptors: *Maryland, *Oysters, *Commercial shellfish, *Regulation, Shellfish, Commercial fishing, Fish harvest, State governments, State jurisdiction, Political constraints, Legal aspects, Administration, Political aspects, Conservation, Fish conservation, Bays, Fish populations, Fish management, Economic efficiency, Aquatic productivity, Public rights, Non-structural alternatives, Legislation, Judicial decisions, Relative rights.
Identifiers: *Constitutionality.

This article considers: (1) the nature of economic problems occasioned by treating oysters as common property, (2) the response of Maryland's legal institutions, and (3) suggested alternatives to the present treatment. In the author's view, Maryland's attempts to regulate, subsidize, and restore excessively exploited public-oyster grounds have not attained the desired result. Entry restrictions on nonresidents and corporations, and depletion controls governing equipment, minimum oyster size, and seasons appropriate for taking oysters are depicted as discriminatory, economically unproductive, and expensive to enforce. The author suggests and traces past attempts at granting exclusive-use rights to oyster grounds. Recognizing political pressure against the revision of existing laws, the author recommends a broad constitutional attack on the Maryland Oyster Code. Legal precedent attacks on the Code under the equal protection and commerce clauses are presented. After a successful judicial nullification of existing laws, the author suggests a legislative delegation of broad management authority to the Fish and Wildlife Administration. Such a grant of authority would allow the Administration to: (1) determine the most desirable mix between public and private ownership, (2) implement the most technologically efficient oystering methods, and (3) flexibly respond to altered conditions. (Earl-Florida)
W71-06606

THE 1958 GENEVA CONVENTION ON THE CONTINENTAL SHELF,
J. A. C. Gutteridge.
In: The British Year Book of International Law 1959, Oxford University Press, Oxford, England, p 102-123, 1960. 75 ref.

Descriptors: *Continental shelf, *International law, *Law of the sea, *Treaties, Aquatic life, International waters, International joint commissions, International commissions, Foreign waters, International Bound and Water Comm., Continental slope, Continental margin, Legal aspects, Commercial fishing, Commercial fish, Commercial shellfish, Natural resources.

Centering on the 1958 Geneva Convention on the Continental Shelf, this article presents an historical analysis of international law concerning continental shelves. Various proposals of signatories to the 1958 Convention are discussed and evaluated. The following subjects are discussed in this article: (1) definition of the continental shelf, (2) nature and extent of the coastal state's rights in the continental shelf, (3) delimitation of the boundary of the continental shelf appurtenant to adjacent states, (4) continental shelf installations, (5) tunneling from terra firma, and (6) the purposes for which a coastal state may exercise sovereign rights over the continental shelf. A coastal state's rights extend to the limit of the territorial sea and beyond to a depth of 200 meters. Coastal states possess sovereign rights to exploit the natural resources of their continental shelf, including sedentary but not swimming species of aquatic life. Installations may be constructed on the continental shelf, and the median line principle is to be used to determine the breadth of the territorial sea. The author concludes that the Convention made a significant contribution to international law even though the breadth of the territorial sea and fishery limits were left unresolved. (Robinson-Florida)
W71-06607

WATER RESOURCES--THE INTEREST AND RIGHTS THEREIN OF THE CITIZEN-BENEFICIARY: A DISCUSSION OF NEW YORK LAW,
G. David Van Epps.
Syracuse Law Review, Vol 21, No 4, p 1173-1192, Summer 1970. 100 ref.

Descriptors: *New York, *Water rights, *Riparian rights, *Public rights, Water resources, Legislation, Riparian waters, Riparian land, Preferences (Water rights), Water pollution, Water pollution control, Pollution abatement, State governments, Eutrophication, Ecology, Environment, Local government, Legal aspects.

The theory that the ultimate impact of the deterioration of water resources is on the quality of life and belongs to the citizenry at large is postulated by this comment. It is suggested that the citizen-beneficiary's interest in water resources should no longer lurk in the background, but be legally recognized and protected. After reviewing various forms of pollution, including eutrophication and some pollution caused by human uses of water, expressions of the citizen-beneficiary's rights are considered. The citizen's riparian, common law, and statutory rights are treated among these rights. While reviewing riparian rights, the author notes that running water is not subject to ownership and that prior appropriation does not apply thereto. The origin of the riparian right from a largely agricultural society is traced. Common law rights, such as the citizen's right to use navigable waters are next reviewed. New York statutory rights of citizens in water resources are considered in detail. The author observes that in recent years the state has been more actively seeking to preserve the citizen interest in waters. He concludes that the citizen-beneficiary's 'patchwork' of water rights is inordinately inflexible to changing society and that more definitive recognition must be afforded the rights of the citizen. (Hart-Florida)
W71-06608

BOUNDARIES ON WATERS,
J. C. Adkins, Jr.
In: Florida Real Estate Law and Procedure, The Harrison Company, Atlanta, Georgia, p 37-48, 1959. 12 p, 35 ref.

Descriptors: *Florida, *Boundaries (Property), *Navigable waters, *Non-navigable waters, Navigation, Ownership of beds, Navigable rivers, Streams, Rivers, Lakes, Boundary disputes, Shores, Tidal waters, High water mark, Low water mark, Tides, Meanders, Riparian rights, Riparian land, Legal aspects, Water law, Land, Land tenure.

Five definitions are used in this article in considering boundaries on waters: (1) the shore is the space between high and low water marks on navigable rivers; (2) uplands are lands bordering on bodies of water; (3) the thread of a stream is the line midway between the opposite shore lines, when the water is at its normal level; (4) tide lands are lands covered and uncovered daily by water through the ebb and flow of normal tides; and (5) seacoast is land adjacent to the sea or ocean. In addition to these definitions, the article covers: (1) history of the law determining water boundaries; (2) navigability of waters; (3) non-navigable waters; (4) navigable waters; (5) artificial waters; (6) meandering waters; and (7) particular calls. The article observes that Florida waters are not considered navigable merely because affected by tides, but must be navigable in fact. It is stated that unless a contrary intention appears, a conveyance of land bounded by water is construed to pass the soil towards the center of the water as far as the grantor owns. Hence, conveyances of land on non-navigable waters pass title to the thread of the stream. Absent a contrary intention, grants of lands bordering on navigable waters carry title to ordinary high water mark. (Hart-Florida)
W71-06609

LEGAL BASES FOR REGIONAL ACTION.
In: River Basin Administration and the Delaware, Syracuse University Press, Syracuse, New York, p 128-148, 1960. 21 p, 43 ref.

Descriptors: *Water resources development, *Interstate compacts, *River basin commissions, *Governments, Legal aspects, Local governments, Federal government, State governments, Interstate commissions, Interstate, Interstate rivers, Delaware River Basin Commission, Legislation, Political aspects, Water management (Applied), Administrative agencies, Administration, Non-structural alternatives.

The legal foundations for planning and managing the water resources of interstate waters are considered in this chapter. One possible source of policy described is an executive committee such as the Delaware River Basin Advisory Committee composed of several governors and mayors; however, the limitations of an executive order are noted. An order: (1) can comprehend interstate areas only at the federal level; (2) is temporary; and (3) is fiscally inadequate. State legislation is the next foundation considered. The author points out that by parallel legislation in adjoining states., interstate management of water resources is feasible. Interstate compacts are also considered as a legal foundation for water resources management. The advantages of the interstate compact are: (1) adequate geographic reach and (2) durability. However, delay in ratification by legislatures is considered a major disadvantage. 'Recent Water Compacts' and 'Federal Work with Compact Agen-

cies' are subtopics examined. The author finds that a federal statute is a prime foundation, since its advantages are: (1) adequate geographic coverage, (2) permanence, and (3) adaptability. The special problem of water allocation is considered in three areas: (1) court decree, (2) federal law and interstate compact, and (3) allocation by administrative agencies. (Hart-Florida)
W71-06610

WATER RIGHTS,
J. C. Adkins, Jr.
In: Rights Incident to Possession of Land, Little, Brown and Company, Boston, p 156-202, 1954. 47 p, 249 ref.

Descriptors: *Water rights, *Streams, *Surface waters, *Groundwater, Appropriation, Natural flow doctrine, Preferences (Water rights), Prescriptive rights, Prior appropriation, Riparian rights, Lakes, Competing uses, Land tenure, Real property, Legal aspects, Reasonable use, Artificial use, Domestic water, Natural use, Relative rights, Riparian land, Drainage, Judicial decisions.

Three main topics are discussed in this chapter dealing with water rights: (1) streams and lakes; (2) surface waters; and (3) diffused groundwaters. In examining streams and lakes, the following areas are considered: (1) riparian rights; (2) the quantitative extent of water rights--natural flow versus reasonable use; (3) the qualitative extent of water rights--domestic versus reasonable commercial uses; (4) the origins, scope and characteristics of appropriation rights; (5) subordination of private rights to public uses; and (6) servitudes for natural stream and flood channels upon riparian lands. Topics discussed with respect to surface waters are: (1) kinds and characteristics of such waters; (2) proprietary rights; (3) rights to obstruct and deflect natural flow; and (4) artificial drainage rights. In relation to diffused surface waters, the following topics are discussed: (1) characteristics of percolating, artesian, and other nontributary groundwaters; (2) proprietary rights; (3) appropriation rights; and (4) interferences with natural flow and purity. (Hart-Florida)
W71-06611

CASTING GARBAGE, ETC, INTO WATERS (CRIMINAL PENALTIES).
Va Code Ann sec 62.1-194 (Supp 1970), amending sec 62.1-194 (1968).

Descriptors: *Virginia, *Waste disposal, *Water pollution control, *Environmental sanitation, Baits, Pollutants, Recreation wastes, Crabs, Fish attractants, Water pollution sources, Water resources, Pollution abatement, Non-structural alternatives, Water policy, Regulation, Institutional constraints, Flotsam, Jetsam, Legislation, State governments, Legal aspects, Wastes.

The act of casting, throwing, or dumping solid waste, except fish or crab bait, into state waters is prohibited in this amendment to existing legislation. Such acts are classified as misdemeanors and are punishable by a fine not exceeding one hundred dollars, a jail term not in excess of thirty days, or both. Enforcement authority is vested in all law enforcement officers of the state and its subdivisions. (Earl-Florida)
W71-06612

SANITARY DISTRICTS (CREATION, AUTHORITY, AND POWERS).
Va Code Ann secs 21-113, 21-118.4, 21-121 (Supp 1970) amending secs 21-113, 21-118.4, 21-121 (1968).

Descriptors: *Virginia, *Multi-purpose projects, *Sewage districts, *State governments, Local governments, Administration, Administrative agencies, Recreation facilities, Garbage dumps, Jurisdiction, Sewerage, Sewage treatment, Eminent domain, Condemnation, Water districts, Legal aspects, Regulation, Drainage systems, Water supply, Water resources development, Legislation, Sanitary engineering, Waste disposal, Environmental sanitation.

The creation and general powers of sanitary districts in Virginia are set forth in this legislation amending an existing statute. The creation of sanitary districts and enlargement of existing districts is authorized by order of a circuit court upon proper application of the voters within a county. The governing boards of such districts are authorized to institute condemnation proceedings for the purpose of constructing water and sewage facilities. Additional powers vested in the governing board by this enactment include the power to: (1) construct, maintain, and operate parking lots, water supply, drainage, sewerage, garbage disposal, heat, light, power, gas, sidewalk, streets, and fire-fighting systems; (2) construct and operate recreational facilities; (3) contract with private or public entities; (4) require owners or tenants of property to connect with systems operated by the district; (5) prescribe and collect charges for the use of sanitary district systems and assert liens where such charges are not paid; (6) employ and compensate necessary personnel; and (7) negotiate for connection of district systems with existing systems and extensions in areas outside of the district. (Earl-Florida)
W71-06613

PUBLIC UTILITIES--ANTI-POLLUTION REQUIREMENTS.
Session Law Service ch 273, p 700, New Jersey, 1970.

Descriptors: *New Jersey, *Public utilities, *Pollution abatement, *Water pollution control, Legislation, Air pollution, Soil contamination, Regulation, Administration, Legal aspects, Utilities, Water works, Electric power industry, Water quality control, Water pollution sources, Power system operations, Public rights, Pollutants, Adoption of Practices, State governments, Standards, Non-structural alternatives.

The rule-making authority of the Board of Public Utility Commissioners is broadened by this amendment allowing the Board to require public utilities to furnish and perform their services in a manner that tends to conserve and preserve the quality of the environment and prevent the pollution of water, air, and land of the state.
W71-06614

WETLANDS ACT OF 1970.
NJ Session Law Service ch 272, p 697-699, 1970.

Descriptors: *New Jersey, *Wetlands, *Coastal marshes, *Permits, Legislation, Salt marshes, Tidal marshes, Estuaries, Estuarine environment, Dredging, State governments, Public rights, Balance of nature, Wildlife conservation, Non-structural alternatives, Administration, Administrative agencies, Regulation, Land tenure, Pollution abatement, Riparian land, Riparian rights, Marine fisheries, Shellfish, Legal aspects.

In order to protect New Jersey's coastal wetlands, permits for the dredging, filling, removing, altering, or polluting of such areas are required by this Act. The Commissioner of Environmental Protection shall inventory and map all coastal wetlands within two years of the effective date of the Act and may adopt, modify, or repeal regulations concerning the issuance of permits. In granting, denying, or limiting any permit the Commissioner must consider the effect of the proposed activity upon: (1) the public health and welfare; (2) marine fisheries; (3) shell fisheries; (4) wildlife; (5) the protection of life and property from flood, hurricane, and other natural disasters; and (6) the ecological balance of the estuarine zone. Failure to comply with orders issued pursuant to this Act, or to obtain required permits, is punishable by fine. The Act also provides for: (1) public hearings prior to the promulgation of regulations; (2) notice by publication, in writing, to affected property owners; (3) the right to judicial review; and (4) the preservation of all existing rights of the state and obligations of riparian owners. (Earl-Florida)
W71-06615

WATER QUALITY STANDARDS (INTERSTATE WATERS OF IOWA).
Federal Register, Vol 35, No 92, p 7379-7380, Tuesday, May 12, 1970.

Descriptors: *Iowa, *Water quality, *Interstate rivers, *Water pollution treatment, Administrative agencies, Federal government, Administrative decisions, Waste dilution, Disinfection, Water purification, Phenols, Chemicals, Chemical wastes, Industrial wastes, Water pollution sources, Water distribution (Applied), Water treatment, Waste water treatment, Waste treatment, Temperature, Thermal pollution, Thermal water.
Identifiers: *Federal Water Pollution Control Act.

Pursuant to the Federal Water Pollution Control Act, the Secretary of the Interior herein establishes water quality standards for certain interstate waters of Iowa. Dilution shall not be a substitute for proper waste treatment. Heat from man-made resources shall not raise the mean daily water temperature more than 5 degrees Fahrenheit and shall not exceed a safe temperature for each individual water body; in any case the temperature shall not exceed 90 degrees Fahrenheit. Concentrations of phenols from other than natural sources shall not exceed one part per billion. Waters designated as a source of public water supply shall be of such quality that USPHS Drinking Water Standards for finished water can be met after conventional water treatment. No later than December 31, 1937, all municipal and industrial wastes discharged into the Mississippi and Missouri Rivers shall receive a minimum of secondary treatment to achieve a 90% reduction of BOD prior to discharge. Continuous disinfection shall be provided for all municipal waste treatment effluents and other wastes where such wastes are discharged into interstate waters designated for public water supplies or recreational use. (Robinson-Florida)
W71-06616

PROTECTION AND CONSERVATION OF WILDLIFE.

16 USCA secs 666f thru 666g, 668cc-1 thru 668cc-6 (Supp 1970).

Descriptors: *Legislation, *Wildlife conservation, *Administrative agencies, *Fish conservation, Administrative decisions, Federal government, United States, Wildlife habitats, Balance of nature, Wildlife management, Conservation, Ecology, Hunting, Habitat improvement, Foreign countries.

Certain United States lands are transferred to the administration and control of the Secretary of the Interior by this legislation. The purpose of the act is to provide a program for the conservation, protection, restoration, and propagation of selected species of native fish and wildlife which are threatened with extinction. To accomplish these purposes, the Secretary of the Interior is authorized to acquire land within the area administered. The Secretary is required to coordinate with other agencies and encourage efforts to further the purposes of the act. Importation into the United States of fish or wildlife which is threatened with worldwide extinction is prohibited. Every five years, the Secretary is required to determine which species of fish or wildlife are endangered according to the following factors: (1) impairment of habitat, (2) over-utilization of the habitat for commercial or sporting purposes, (3) disease or predation, or (4) other natural or man-made factors affecting the existence of any species. Civil penalties for violation of the section are limited to $5000; however, a criminal penalty of $10,000 or imprisionment for one year may be imposed for willful violation of the act. In addition, the Secretary is required to encourage foreign nations to protect endangered wildlife. (Hart-Florida)

W71-06617

THE POLITICS OF WATER RESOURCE MANAGEMENT THROUGH ARIZONA WATER-RELATED REGULATORY AGENCIES,
Arizona Univ., Tucson. Dept. of Government.
J. A. Null.
PhD Thesis, 1970. 316 p, 3 fig, 15 tab, 387 ref, 4 append. OWRR Project B-003-ARIZ (13).

Descriptors: *Arizona, *Water users, *Political aspects, *Administrative agencies, State governments, Governments, Administration, Regulation, Water rights, Political constraints, Water resources, Water resources development, Legal aspects, Water utilization, Water demand, Water supply.

Centering on the policy-formulating process in water agencies, this dissertation explains how water regulatory agencies function in Arizona. Legal powers of agencies and their behavior in regard to these powers are compared. The study concludes that administrative laws and procedures are the result of interest group activity against the state administrative bureaucracy. Commercial and municipal interests are challenging the monopoly of farm-ranch and conservation oriented association influence in water management. There are fourteen agencies with power to regulate the use of water in Arizona; the State Land Department and the Arizona Corporation Commission have the broadest areas of jurisdiction. The author maintains that the state government must assume a vigorous role in water management. The state must solve two problems: (1) revision of water law and (2) administrative reform. The best method of solving these problems is by establishment of a state administrative agency with power to investigate, plan, and coordinate the management of water usage. The author recommends the commission form of administrative agency. He feels that this form of agency would provide broad representation for varied water interests. The author concludes that such a solution is politically feasible. (Robinson-Florida)
W71-06618

WATER RESOURCES ON THE PUBLIC LANDS--PLLRC'S SOLUTION TO THE RESERVATION DOCTRINE,
Frank J. Trelease.
Land and Water Law Review, Vol 6, No 1, p 89-107, 1970. 35 ref. OWRR Project A-999-WYO (14).

Descriptors: *Reservation doctrine, *Federal reservations, *Federal-state water rights conflicts, *Water supply, Administration, Administrative agencies, Legal aspects, Federal government, State governments, Compensation, Prior appropriation, Water rights, Federal jurisdiction, State jurisdiction, Water demand, Water resources, Water resources development, Water shortage, Planning, Water utilization, Economic impact, Water law.

This article deals with that portion of the Report of the Public Land Law Review Commission pertaining to the reservation doctrine. After a summary of the Report and its recommendations, the following areas are discussed: quantification of the problem, procedures for administrative determination of the reasonableness of quantities claimed, and compensation. The two most important problems to be resolved are the uncertainty engendered by the doctrine and the equity of holders of water rights vested under state law. The Commission recommended that the implied reservation doctrine of water rights for federal lands should be clarified in four ways: (1) amounts of water claimed should be formally established; (2) procedures for contesting claims should be provided; (3) water requirements for future reservations should be expressly reserved; and (4) compensation should be awarded where interference results with claims valid under state law before the decision in Arizona v. California, 373 U.S. 546 (1963). The author disagrees with the Commission in that he feels a case by case approach is best for settling disputes in this area, but agrees that water users harmed by exercise of the reservation doctrine should be compensated. The author concludes that the Commission's recommendations should be tried and supported to determine their efficacy. (See also W71-06621 thru W71-06623) (Robinson-Florida)
W71-06620

LET THERE BE NO NAGGING DOUBTS: NOR SHALL PRIVATE PROPERTY, INCLUDING WATER RIGHTS, BE TAKEN FOR PUBLIC USE WITHOUT JUST COMPENSATION,
Charles E. Corker.
Land and Water Law Review, Vol 6, No 1, p 109-115, 1970. 6 ref.

Descriptors: *Reservation doctrine, *Compensation, *Federal-state water rights conflicts, *Water supply, Federal reservations, Administration, Administrative agencies, Legal aspects, Water law, Federal government, State governments, Prior appropriations, Water rights, Federal jurisdiction, State jurisdiction, Water demand, Water resources, Water resources development, Water shortage, Planning, Water utilization, Economic impact.

The author of this article contends that when the United States exercises the reservation doctrine and utilizes water formerly used by private citizens, it should pay for it. The Public Land Law Review Commission made four proposals dealing with the reservation doctrine: (1) federal agencies should ascertain and given public notice of the projected water requirements for reserved areas for the next forty years; (2) procedures for contesting every claim should be established; (3) future reservations of public lands should be accompanied by a statement of prospective water requirements and an express reservation of such quantity of water; and (4) compensation should be awarded where such reservation results in interference with claims valid under state law prior to Arizona v. California, 373 U.S. 546 (1963). The author contends that it would be impossible to determine the projected water requirements for the next forty years and that it is impractical to attempt to determine prospective water requirements for future reservations of public land. He believes that judges unspecialized in water administration are not equipped to handle water rights cases. The author also feels that there is no valid reason for distinguishing between appropriations of water before and after 1963. (See also W71-06620) (Robinson-Florida)
W71-06621

THE IMPLIED RESERVATION DOCTRINE: POLICY OR LAW,
John A. Carver, Jr.
Land and Water Law Review, Vol 6, No 1, p 117-122, 1970. 11 ref.

Descriptors: *Reservation doctrine, *Compensation, *Federal-state water rights conflicts, *Water supply, Federal jurisdiction, Federal reservations, Jurisdiction, State jurisdiction, Water rights, Federal government, State governments, Administration, Administrative agencies, Legal aspects, Water demand, Water resources, Water resources development, Water shortage, Planning, Economic impact, Condemnation value, Water utilization.

Compensation for vested water rights taken by the federal government pursuant to the implied reservation doctrine is evaluated in this article. The author considers that portion of the Report of the Public Land Law Review Commission dealing with the implied reservation doctrine and the judicial background of the doctrine. The author contends that the Commission's proposal that the federal government should determine its water requirements 40 years in advance is impractical. He also feels that a sensible system of water rights ought to include security, and that there should be no uncompensated transfer of water rights from one user to another. Because of the bureaucratic tendency to avoid the charge of having given away federal rights, the author recommends that Congress provide specific guidelines for compensation. The Commission seems to regard court-made law as less susceptible to congressional amendment than statutory law, but the author concludes that this may be irrelevant, since the Flood Control Act of 1944 provides for compensation for the taking of a water right vested by the laws of the concerned state. (See also W71-06620). (Robinson-Florida)
W71-06622

DISCUSSION: WATER RESOURCES.
Land and Water Law Review, Vol 6, No 1, p 123-133, 1970.

Descriptors: *Reservation doctrine, *Federal-state water rights conflicts, *Water supply, *Water resources development, Federal reservations, Compensation, Water rights, Federal government, Developed waters, Planning, Administrative agencies, Legal aspects, Water demand, Water policy, Regulation, Condemnation values, Prior appropriation, Water sources, Water utilization, Water resources, Water requirement, Water users, Judicial decisions.

The oral discussion recorded considers: (1) the background of the Pelton Dam case, (2) the implied reservation doctrine as it affects future use and disposal of public lands, and (3) circumvention of the implied reservation doctrine. According to Mr. Corker the decision in the Pelton Dam case is sound law. Mr Barry contends that the implied reservation doctrine is not a problem and that the United States only owns that water sufficient to carry out the purposes of the reservation, not all that arises on the reservation. He further feels that the federal government intends to compensate people whose vested water rights are taken under the doctrine. Mr Marty states that water is wasted if not used and that certainty should be established to encourage maximum use of water. Mr. Clark maintains that the Pelton Dam case does not involve water rights. Mr. Carmichael disagrees with Mr. Marty's statement that water is wasted if not used. Development by either the industrialist or the farmer will require certainty of water rights according to Mr. Clyde. (See also W71-06620). (Robinson-Florida)
W71-06623

CONSERVATION COMMISSIONS IN MASSACHUSETTS: WITH A SUPPLEMENTARY REPORT ON THE EMERGENCE OF CONSERVATION COMMISSIONS IN SIX OTHER NORTHEAST STATES,
Conservation Foundation, Wash., D.C.; and New England Conservation Services Center, Lincoln, Mass.
Andrew J. W. Scheffey, and William J. Duddleson.
New England Conservation Services Center, Lincoln, Massachusetts, 1969. 216 p, 15 photo, 1 tab, 1 append.

Descriptors: *Massachusetts, *Conservation, *Organizations, *Local governments, New England, Northeast U.S., Rhode Island, Connecticut, New Hampshire, Maine, New York, New Jersey, Water conservation, Land resources, Water resources development, State governments, Legislation, Administrative agencies, Natural resources, Pollution abatement, Environmental effects, Air polution, History, Social aspects, Political aspects, Legal aspects.

The emergence of local conservation commissions throughout the Northeast is a significant pehnomenon, both as a political development and as an expression of the public's growing concern for environmental quality. A study of the municipal conservation commission concept in Massachusetts, where the movement originated, reveals its successes in the acquisition and protection of open space and wildlife areas, in creating grassroots interest in pollution control, and in acting as a catalyst for conservation action by other local and state agencies and by private interests. The conser-

vation commission has been tested and found to be a practical local instrument for environmental improvement. The growth of the movement is outlined within a broad historical perspective. The legislative steps that have fostered its growth include self-help acts and a specific Conservation Commission Act. A questionnaire survey of all such commissions in Massachusetts reveals certain principles of effective operation that are beginning to emerge. A supplementary report on the emergence of local conservation commissions in six other Northeast states indicates the growing acceptance of the viability of such commissions in improving the quality of air, land, and water resources development. (Smiljanich-Florida)
W71-06624

GEOTHERMAL STEAM ACT OF 1970 (EXPLOITATION AND DEVELOPMENT OF GEOTHERMAL STEAM RESOURCES).
Pub L No 91-581, 84 Stat 1566, 15 US Code Cong and Admin News, p 6778-6788 (1970). 11 p.

Descriptors: *Thermal water, *Steam, *Mineralogy, *Administration, Administrative agencies, Legislation, Thermal properties, Leases, Permits, Natural resources, Federal government, Water types, Wells, Drilling, Exploration, Exploitation, Mining, Conservation, Energy, Heat, Gases, Oil, Helium, Resource development.
Identifiers: *Geothermal Steam Act, *Geothermal steam.

Authorizing the Secretary of the Interior to make disposition of geothermal steam and associated geothermal resources, the Congress of the United States enacted the Geothermal Steam Act of 1970. The Act defines geothermal steam and associated resources, including: (1) all products of geothermal processes, enbracing indigenous steam, hot water, and brines; (2) similar products resulting from water, gas or other fluids artificially introduced into geothermal formations; (3) heat or other associated energy found in geothermal formations; and (4) any byproduct derived therefrom. The term byproduct is defined as any mineral (exclusive of oil, hydrocarbon gas, or helium) found in geothermal formations which has insufficient value to warrant extraction by itself. The Secretary of the Interior is authorized to issue leases for development and utilization of geothermal steam resources and to formulate regulations governing leases. Leases shall be secured by competitive bidding. The Act provides for: (1) maximum acreage of leases per person, (2) royalty payments to the government, (3) duration of leases, (4) termination and adjustment of leases, (5) duties of lessees in the exploration and exploitation of geothermal steam resources, and (6) coexistence with leases under other federal mining acts. The Secretary of the Interior has broad discretion in formulating regulations to implement the provisions of the Act. (Duss-Florida)
W71-06650

PROPOSED LEGISLATION FOR PRESERVING, RESTORING AND IMPROVING WETLANDS FOR MIGRATORY WATERFOWL.

S Rep No 1393, 91st Cong, 2d Sess, 15 US Code Cong and Admin News, p 7110-7117 (1970). 8 p.

Descriptors: *Waterfowl, *Migratory birds, *Wetlands, *Wildlife conservation, Legislation, Marshes, Swamps, Surface waters, Surface runoff, Federal government, Administrative agencies, Land, Contracts, Costs, Water quality, Flood control, Erosion, Land classification, Groundwater, Water pollution, Breeding, Nests.
Identifiers: *Water Bank Act.

Recommending passage of a House bill (H.R. 15770) entitled the 'Water Bank Act', which ultimately was enacted as Public Law 91-559, this Senate report discusses the background and need for the bill, gives a section-by-section analysis, and reprints two departmental reports opposing the bill. The principal objective of the bill is to preserve the habitat of migratory waterfowl by preserving, restoring, and improving wetland areas. The bill is necessary because numerous acres of waterfowl habitat are being lost due to the demands of civilization and because existing legislation providing for acquisition of wetlands by the Department of the Interior has proved inadequate. The bill authorizes the Secretary of Agriculture to enter into ten-year renewable contracts with landowners and operators of important waterfowl areas for conservation of water in wetlands. Various sections describe: (1) the land available for the program, (2) the obligations of those entering into contracts, (3) the method of payment for contracts, (4) contract renewals, (5) termination of contracts, and (6) maximum appropriations during any calendar year. The Departments of Agriculture and Interior opposed the bill on the basis that any program should be administered through the Department of the Interior. (Duss-Florida)
W71-06651

SENATE REPORT RECOMMENDING PASSAGE OF A FEDERAL ENVIRONMENTAL EDUCATION ACT.

S Rep No 91-1164, 91st Cong, 2d Sess, 13 US Code Cong and Admin News, p 5763-5774 1970. 12 p.

Descriptors: *Environment, *Environmental effects, *Education, *Administration, Administrative agencies, Federal government, Legislation, Ecology, Ecosystems, Resource development, Coordination, Pollution, Oceans, Public health, Schools (Education), Local governments, Government finance, Projects, Technology, Balance of nature, Resources, Rural areas, City planning.
Identifiers: *Environmental Education Act.

Recommending passage of a proposed Environmental Education Act (which ultimately became Public Law 91-516), this Senate report discusses the legislation under three headings: (1) background and purpose, (2) major provisions of the bill, and (3) a section-by-section analysis. The report initially emphasizes the need to inform the public on matters which concern environmental quality. Quotations by various educators indicate the broad approach that is required in environmental education, and a summation describes it as an integrated process embracing such factors as population, pollution, resource allocation and depletion, conservation, technology, and environmental planning. The major provisions of the bill would: (1) establish an Office of Environmental Education, (2) authorize grants and contracts with governmental and educational institutions for projects and programs in environmental education, (3) give guidelines for the use of funds, (4) create an Advisory Council on Environmental Quality Education, and (5) authorize cooperative efforts among federal agencies to provide technical assistance to various institutions engaged in environmental education. The section-by-section analysis considers each part of the bill and includes criteria for approval of applications for financial assistance and the amount of funding for the program. (Duss-Florida)
W71-06662

REORGANIZATION OF EXECUTIVE DEPARTMENTS TO COORDINATE FEDERAL ENVIRONMENTAL POLICIES.

8 US Code Cong and Admin News, p 2996-3010 (1970). 15 p.

Descriptors: *Administrative agencies, *Federal government, *Environment, *Coordination, Ecology, Environmental effects, Water pollution, Water pollution control, Water quality, Water quality control, Air pollution, Solid wastes, Wildlife, Conservation, Pesticides, Standards, Legislation, Oceans, Atmosphere, Marine fisheries, Weather, Natural resources, Resource development, Exploration, Exploitation.

In an effort to systematically organize the federal government's environmental activities, President Nixon submitted to Congress two reorganization plans for the executive branch. The first establishes an Environmental Protection Agency (EPA), which would pull together into one agency a variety of research, monitoring, standard-setting, and enforcement activities now scattered among several departments and agencies. Among the functions transferred to the EPA are: (1) those carried out through the Federal Water Quality Administration, (2) pesticide studies by the Department of the Interior and other agencies, and (3) activities of the National Air Pollution Control Administration and Bureau of Solid Waste Management. The principal roles and functions of the EPA would be: (1) standards-setting, (2) research, (3) providing assistance to other agencies, and (4) developing environmental policies. The second reorganization plan would create within the Department of Commerce a National Oceanic and Atmospheric Administration (NOAA), which would consolidate federal activities concerning development of sea resources and research into oceanic and atmospheric phenomena. Among the activities taken over by the NOAA will be those of: (1) the Bureau of Commercial Fisheries, (2) the Environmental Services Administration, and (3) the Marine Minerals Technology Center. Additionally, certain activities of the Departments of the Army and Navy would be taken over by the NOAA. (Duss-Florida)
W71-06682

PROPOSED FEDERAL FUNDING FOR CONSTRUCTION OF COMMUNITY WATER AND SEWAGE FACILITIES.
HR Rep 91-1263, 91st Cong, 2d Sess, 11 US Code Cong and Admin News p 4225-4229 (1970). 5 p, 1 tab.

Descriptors: *Sewage treatment, *Sewage disposal, *Financing, *Water pollution, Water pollution control, Sewers, Public health, Legislation, Federal government, Cities, Waste disposal, Sewage, Water pollution sources, Local governments, Coordination, Water quality, Pollution abatement, Administrative agencies, Administration, Political aspects, Government finance.

Recommending passage of a House bill (H.R. 17795 which ultimately became Public Law 91-431) to provide funds for water and sewer facilities, this report by the Committee on Banking and Currency sets out the important aspects of the legislation. Included in the report are: (1) the objectives of the bill, (2) its background, (3) why the bill is needed, (4) the availability of funds for projects in small towns, (5) additional views of the committee, and (6) dissenting views. The bill amends Title VII of the Housing and Urban Development Act of 1965 and would: (1) help finance construction of urgently needed public facilities to provide for the public health and check water pollution, (2) reenact the balance of the authorization for basic water and sewer facilities under the 1965 Act, (3) make an additional one billion dollars available for grants, and (4) extend the time in which a community could qualify for a basic water and sewer facilities grant. The bill is necessary because local communities do not have the resources to provide needed water and sewer facilities. Funds would be available for projects in small communities. Dissenting views on the bill emphasized the lack of available funds to finance the proposed projects. (Duss-Florida)
W71-06689

MUNICIPALS WANT NEW CENTRAL BODY FOR WATER AND SEWAGE.
For primary bibliographic entry see Field 05G.
W71-06762

MERSEY RA STANDARDS FOR EFFLUENTS.
For primary bibliographic entry see Field 05G.
W71-06763

NEW AND PROPOSED LAWS,
For primary bibliographic entry see Field 05G.
W71-06764

THE RESPONSIBILITY OF TREATMENT PLANT OPERATORS UNDER THE PORTER-COLOGNE WATER QUALITY CONTROL ACT,
For primary bibliographic entry see Field 05G.
W71-06766

THE SEWERAGE (SCOTLAND) ACT 1968,
For primary bibliographic entry see Field 05G.
W71-06768

PORTER-COLOGNE ACT REVISITED,
For primary bibliographic entry see Field 05G.
W71-06769

UTILIZATION OF STREAM FOR STORM DRAINAGE,
For primary bibliographic entry see Field 05G.
W71-06770

INTRODUCTION TO FEDERAL, STATE AND LOCAL ACTION PROGRAMS TO SOLVE ANIMAL WASTE DISPOSAL PROBLEMS,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 05G.
W71-06824

WATER RIGHTS LAW CONFERENCE,
New England Council of Water Center Directors, Boston, Mass.

Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d. 116 p, 1 map, 110 ref. OWRR Project A-999-MASS (1).

Descriptors: *New Hampshire, *New England, *Water rights, *Conferences, Water law, State governments, Federal government, Water pollution, Water pollution control, Water pollution effects, Water pollution sources, Pollution abatement, Water resources development, Natural flow doctrine, Riparian rights, Water Resources Planning Act, Water Resources Research Act, Water Quality Act, Public rights, Water utilization, Alteration of flow, Access routes, Diversion, Repulsion (Legal aspects), Prior appropriation.

The topics covered in these proceedings of the Water Rights Law Conference include: (1) basic concepts of private water rights; (2) public water use rights; (3) federal-state cooperative research in water law and institutions; (4) diversions and alterations of stream flow; (5) the law relating to access to public waters in New Hampshire; (6) multiple use and water law; (7) multiple-use problems of water law in New Hampshire; and (8) water-rights laws in New England. In the first presentation such basic terms as navigability, riparian doctrine, prior appropriation, reasonable use doctrine and common enemy rule are covered. At the end of the first presentation is a series of questions from the conference floor, and the answers furnished by the speaker. The discussion of federal-state cooperative water law research notes three needs to solve water problems: (1) research programs; (2) a national water resources agency; and (3) a federal-state pollution control program. The speaker postulates that this need has been satisfied with enactment of the Water Resources Research Act, Water Resources Planning Act, and the Water Quality Act. The speaker analyzes the effect of these acts upon water problems. (See also W71-06902 thru W71-06909) (Hart-Florida)
W71-06901

BASIC CONCEPTS IN PRIVATE WATER RIGHTS,
James H. Kendall, and Richard E. Whiting.
In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d., p 5-33. 52 ref.

Descriptors: *New England, *Riparian rights, *Prior appropriation, *Water law, Natural flow doctrine, Navigable rivers, Navigation, Navigable waters, Federal govenmemt, State governments, Alteration of flow, Artificial use, Competing uses, Domestic water, Legal aspects, Natural use, Obstruction to flow, Reasonable use, Riparian waters, Stock water, Water pollution, Waste disposal.

In New England states the riparian doctrine determines the relative rights of individuals to use water flowing in a natural watercourse. It is applied to surface flow of rivers and streams and to underground waters in defined watercourses. The riparian doctrine is inapplicable to non-navigable waters. All use of navigable waters is subjected to the federal power over commerce and navigation. The doctrine of prior appropriatons gives priority of water usage to the chronologically earliest beneficial use. The doctrine of prior appropriation is codified. Each riparian lawful purposes and detain all the streamflow for domestic uses. Downstream riparians have a remedy, if only for nominal damages, when the upstream owner unreasonably obstructs or detains the streamflow. If the downstream owner fails to sue within the statue of limitations his rights are forfeited. However, in some jurisdictions no cause arises if no harm is done to the lower riparian owner. The stream may be used for discharge of wastes; decisions hold waste discharge is to be tested by the reasonable use doctrine. However, discharge of wastes is subjected to attack on a nuisance theory. (See also W71-06901) (Hart-Florida)
W71-06902

COMMENTS ON PUBLIC WATER USE RIGHTS,
Orlando E. Delogu.
In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d., p 34-43. 34 ref.

Descriptors: *Public rights, *Water rights, *Water utilization, *State governments, Navigation, Navigable waters, Water resources, Water resources development, Public benefits, Water law, Legal aspects, Reservation doctrine, State jurisdiction, Federal jurisdiction.

The concept of public use water rights was conceived by Justinian, and Bracton used the theory in his early common law treatises. Navigability is the ultimate test used to determine whether waters are subject to public water use rights. Since the definition of 'navigable' has been expanded to a point where almost all waters can be called navigable, public water use rights are now more prevalent than a common law. The state, as the institutional embodiment of the public, is deemed the trustee of the water rights; hence enforcement of a member's rights must be effected through the state. A state may regulate and control navigable waters by exercise of its plenary sovereign and police powers. States have enlarged the scope of public water use rights by: (1) redefining 'navigable'; (2) building dams and creating lakes; (3) facilitating access to waters by building roads; (4) purchasing and condemning pirvate water rights for public use; and (5) judicial and administrative redefining and narrowing of the concept of reasonable and beneficial use. The public clamor for more and better water necessitated the enlargement of public water use rights. (See also W71-06901) (Hart-Florida)
W71-06903

FEDERAL-STATE COOPERATIVE RESEARCH IN WATER LAW AND INSTITUTIONS,
Roland R. Renne.
In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d., p 44-54.

Descriptors: *Water Quality Act, *Water Resources Planning Act, *Water Resources Research Act, *Water resources development, Legislation, Federal government, State governments, Water law, Water pollution, Water pollution control, Projects, Grants, Research and development.

To solve the nation's major water problems, three vital needs must be met: (1) a coordinated, continuing, scientific water resources research program to increase available supplies and to increase efficiency in water use; (2) a national water resources review office or council for coordinated, continuing, comprehensive planning of water resources development and management for all major river basins, including active participation by the states through a program of grants for water resources planning; and (3) an effective federal-state water pollution control program with authority to establish and enforce water quality standards for preventing further pollution and clearing up existing pollution. The needs have been met by passage of the Water Resources Research Act, the Water Resources Planning Act, and the Water Quality Act. The new cooperative research program has demonstrated great potential strength in helping solve serious water problems. Current federal expenditures supporting water resources research are at $100 million annually. There are 18 projects funded under the Water Resources Act which deal with water law and institutions. Although the program under the Research Act is only two years old. 2/5 of the states have made excellent progress. (See also W71-06901) (Hart-Florida)
W71-06904

DIVERSIONS AND ALTERATIONS OF STREAM FLOW,
Robert L. Leonard.
In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d., p 55-66. 1 map, 17 ref.

Descriptors: *Diversion, *Alteration of flow, *Natural flow doctrine, *Relative rights, Reasonable use, Withdrawl, Streamflow, Obstruction to flow, Reservoirs, Irrigation practices, Riparian rights, Water rights, Irrigation programs, Irrigation wells, Pumping plants, Water allocation (Policy), Water distribution (Applied), Industrial water, Cities, Condemnation, Eminent domain, Compensation, Conservation, Dams.

Technological changes and recent drought have resulted in substantial investments in irrigation equipment by farmers, nurserymen, and golf-course operators. Hence, the quantity of water used for irrigation will increase. However, the increases in irrigation have not created unusual controversy over private water rights; where natural flow has been inadequate to supply new needs, the deficit has usually been furnished from storage ponds or high capacity wells. Alterations of stream flow result from releases by hydroelectric plants to meet the demand peaks for electricity. Seasonal releases from water storage conform to seasonal demands for electricity. Since there is a paucity of remaining sources for hydroelectric power in New England, future demand will be met with pumped storage. Industries using large quantities of water generally develop their own supply. Although the water quality may be impaired upon return, flow is not seriously altered. State and municipal entities may condemn land, flowage, and water rights by providing compensation. This condemnation power, with one exception, has been free of any requirement to maintain a minimum flow downstream. In one instance, conservation groups induced lawmakers to require a minimum downstream flow. (See also W71-06901) (Hart-Florida)
W71-06905

THE LAW RELATING TO ACCESS TO PUBLIC WATERS IN NEW HAMPSHIRE,
A. J. Kalinske.

In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d., p 67-86.

Descriptors: *New Hampshire, *Access routes, *Right-of-way, *State governments, Local governments, Recreation, Public rights, Water rights, Water utilization, Water law, Legal aspects, Judicial decisions, Legislation, Great ponds, Administrative agencies.

Any natural, fresh-water pond in New Hampshire containing more than 10 acres is a 'great pond' and within the class of public waters. Tidewaters are also considered public. By statute, all natural bodies of water of 20 acres are public. Navigable waters are distinguished from public waters by statutory definition. There has been no standard aprogram for providing for access by the public waters; informational signs were not provided, and state agency responsibility has never been clearly defined. With the increased popularity of recreational boating, the inadequacy of access points became acute; consequently, a project has begun to inventory all public waters and eventually rstablish access points. Whether public water rights exist in waters to which access can only be obtained by trespass has not been decided by New Hampshire courts; however, provisions have been made by statute to furnish access to public waters. Local governments may be petitioned to furnish access, and it may be purchased after proper proceedings. Also, a Right-of-Way Board investigates all transactions involving public lands to determine if a right-of-way to public waters should be retained. A Public Access Advisory Board should be established to select access sites to public waters. (See also W71-06901) (Hart-Florida)
W71-06906

MULTIPLE USE AND WATER LAW,
F. O. Sargent.
In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, p 87-96. 2 ref.

Descriptors: *New England, *Water law, *Water resources development, *Legislation, State governments, Administrative agencies, Water resources, Beds under waters, Ownership of beds, Stream beds, Riparian rights, Water management (Applied), Multiple-purpose projects, Non-structural alternatives, Water allocation (Policy), Conjunctive use, Multiple purpose, Optimum development plans, Water pullution, Watersheds (Basins).

The two major bodies of water law--common law and statutory law--are inadequate guides to water resource development. The common law arose in England, where water is plentiful. Although the common law has been modified in America, it has always been inadequate for managing water resources development where water was scarce and multiple uses conflict. Statues governing pollution and water quality are well developed, but other statutory provisions have not been revised, updated, or supplemented to regulate current water resource development problems. The following legislation is necessary: (1) clarifying rights in streambeds; (2) governing minimum streamflow; (3) providing for public access to public waters; (4) describing the procedures to be followed and the state agencies responsible when anyone desires to alter beds under water; (5) revising water management and administration procedures; and (6) providing procedures for water and stream bank zoning. Furthermore, the multiple-use concept of water requires a river basin approach to water resource law. Four types economic analyses should be made for all major resource development projects: (1) benefit-costs; (2) economic development potential; (3) location theory; and (4) opportunity-cost. (See also W71-06901) (Hart-Florida)
W71-06907

MULTIPLE-USE PROBLEMS OF WATER LAW IN NEW HAMPSHIRE,
Robert H. Forste.
In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d., p 97-106. 1 ref.

Descriptors: *New Hampshire, *New England, *Multiple purpose, *Public rights, Water rights, Water pollution, Water pollution control, Water utilization, Natural flow doctrine, Riparian rights, Riparian waters, Recreation, Swimming, Dams, Flood control, Sewage, Sewage cisposal, Waste disposal, Legal aspects, Water law, Judicial decisions, Reasonable use, Beneficial use, Water resources, Water distribution (Applied).

Throughout New England conflicts increasing in both number and intensity are occurring in the competition for varied uses of water. The riparian rights doctrine governs water use in New Hampshire; all riparian owners may reasonably use and enjoy the water and have the right to natural flow. Upstream and downstream owners have equal rights. 'Great ponds' in New Hampshire are public waters. Six multiple-use conflicts are: (1) flood control, recreation, and public water supplies; (2) sewage-waste disposal and recreation; (3) powder, recreation, waste disposal, irrigation, and public water supplies; (4) power, pollution and recreation; (5) mineral exploitation and recreation/esthetics; and (6) public water supplies and recreation. The absence in water law of two economic elements is reflected in the inability of case law to deal with external effects and the general absence of a price system to assist in water allocation. Economists should be able to furnish courts and commissions with policy alternatives available in regulating water use. Courts must be willing to accept input from the economist before handling down a 'reaonable use' decision concerning water law. (See also W71-06901) (Hart-Florida)
W71-06908

WATER RIGHTS LAWS IN NEW ENGLAND: SUMMARY AND OBSERVATIONS,
Harold H. Ellis.
In: Proceedings, Water Rights Law Conference, Boston, Mass, November 10, 1966. New England Council of Water Center Directors, n.d., p 107-115. 1 ref.

Descriptors: *New England, *Water utilization, *Water resources development, *Legislation, Water rights, Riparian rights, Riparian land, Public rights, Access routes, Water allocation (Policy), Water distribution (Applied), Drainage, Water pollution, Water pollution control, Pollution abatement, Floods, Flood control, Obstruction to flow, Dams, Diversions, Eminent domain, Condemnation, Compensation, Prescriptive rights, Legal aspects.

As water-use conflicts increase in quantity and intensity, water rights laws become more important. Neigher common law nor legislation has kept pace with water-use conflicts; hence additional legislation will be necessary to cope with emerging water problems. Some of these emerging problems are: (1) the respective roles of courts, governments and administrative agencies; (2) definitions of riparian rights, riparian land, and permissibility of non-riparian use; (3) private versus public rights, conflicting public uses, and public access problems; (4) coordination of water allocation and pollution control, water development, drainage or flood control measures; (5) which kinds of pollution control measures to adopt; (6) obstructions to watercourses; (7) uses of zoning, eminent domain, and minimum stream-flow provisions; (8) coordination of rights in or regulation of interconnected sources of water; (9) prescriptive water rights; (10) compatibility of water laws with technical knowledge and innovations concerning the state, multiple use, and development of water resources; (11) certainty and flexibility of water allocation systems; and (12) reliance upon market forces to allocate water resources. Development of proposals for legislative and other methods of alleviating water problems must be facilitated by technicians, lawyers economists, and public officials. (See also W71 06901) (Hart-Florida)
W71-06909

GOVERNOR'S CONFERENCE ON WATEI RESOURCES MANAGEMENT IN WISCONSIN.
Available from Wisconsin Water Resource Center, Madison 53706 for $1.00. Selected Paper and a Summary of the Proceedings of Governor' Conference on Water Resources Management Madison, October 14 and 15, 1965. University o Wisconsin, Water Resources Center, Madison March 1966. 76 p.

Descriptors: *Wisconsin, *Water resource development, *Planning, *Water managemen (Applied), Water resources, Long-term planning Federal government, State governments, Legisla tion, Water quality control, New York, Agricul ture, Conservation, Industries, Cities, Recreation Economics, Water requirements, Pollution abate ment, Water rights, Legal aspects, Administrativ agencies, Supervisory control (Power).

At the request of the Governor of Wisconsin, th Governor's Committee on Water Resources spon sored a conference on water resources manage ment. The purposes of the conference were: (1) t provide the members of the committee with a cur rent picture of the state's water problems and (2 to act as a sounding board for citizens of the stat concerned with water resources. Addresses con tained herein deal with: (1) water resources an Wisconsin' future; (2) water resources plannin and development; (3) the impact of federal legisla tion on Wisconsin's water quality and wate resources; (4) a case study of water resource planning in Wisconsin; (5) water resource planning in New York; (6) water resource management in Wisconsin from the viewpoint o agriculture, conservation, industry, municipalities and recreation; (7) the economics of wate management, (8) water needs and water resources (9) water pollution control; (10) water rights an legislation; and (11) conservation and recreation Suggestions posed by the discussion groups in cluded the need for reorganization of the agencie dealing with water resources, reworking of th statues relating to water use, and reconsideration o the constitutional restriction forbidding works o internal improvement by the state. (See also W71 06911 thru W71-06913) (Smiljanich-Florida)
W71-06910

FEDERAL LEGISLATION--WATER QUALITY AND WATER RESOURCES--IMPACT ON WISCONSIN,
Wisconsin Univ., Madison. Water Resource Center.
Gerald A. Rohlich.
In: Selected Papers and a Summary of th Proceedings of Governor's Conference on Wate Resources Management, Madison, October 14 an 15, 1965. University of Wisconsin, Wate Resources Center, Madison, March 1966, p 10-12

Descriptors: *Wisconsin, *Water Resource Research Act, *Water Resources Planning Ac *Water Quality Act, Federal government, Ad ministrative agencies, Water resources develop ment, Federal jurisdiction, Federal-state wate rights conflicts, State governments, Legislatio Planning, Administration, Research and develop ment, River basin development, Water quality Water pollution, Eutrophication, Coordination, In dustrial wastes, Municipal wastes, Storm drain Standards, Legal aspects, Water allocation (Po icy).

The passage of three federal acts provides a avenue of joint federal-state cooperation in wate resource research, planning, and quality contro The Water Resources Research Act makes fund available for the conduct of water resource research in the broad sense. Such funds in Wisco sin are administered by the Water Resource

enter. The two major areas of research have in-lved the problem of eutrophication of lakes and at of river basin planning and coordination. The ater Resources Planning Act establishes the deral Water Resources Council. The Council is assess the adequacy of regional water supplies in e United States and study the adequacy of ad-nistrative and statutory means for the coordina-n of water resources policies and programs. isconsin is particularly interested in that part of e Act which makes funds available to assist in veloping comprehensive water resource plans. e Water Quality Act of 1965 establishes the deral Water Pollution Control Administration. e Act recognizes the problems of pollution used by the discharge of municipal and industrial stes and storm water sewerage. The Act sets th procedures relative to the adoption by the tes of water-quality criteria applicable to in-state waters. (See also W71-6910) (Smiljanich-orida)
71-06911

ATER RESOURCES PLANNING IN NEW ORK,
lson A. Rockefeller.
Selected Papers and a Summary of the oceedings of Governor's Conference On Water sources Management, Madison, October 14 and , 1965. University of Wisconsin, Water Resource nter, Madison, March 1966, p 18-20.

escriptors: *New York, *Wisconsin, *Water sources development, *Long term planning, ate governments, Federal government, Local vernments, Cities, Future planning (Projected), nancing, Cost sharing, Coordination, Estimated sts, Research and development, Administrative encies, Water management (Applied), Adminis-tion, Pollution abatement, Municipal wastes, In-strial wastes, Sewage treatment, Political pects, Legal aspects.

sed on the New York experience, it is the thor's belief that the states have the largest ligation and opportunity for leadership in the ld of water resources development. New York organized its water resources management agen-s under central control. Regional water sources planning and development boards insure ass-roots participation and bring about coordina-n at the local level of local, state and federal ac-ity. At the same time, the centralizing of state licy making and leadership permits the state to an effective agent in any cooperative studies th federal and local agencies. The problem of ancing pollution abatement has led to the eaker's proposed Pure Waters Program. The goal this program is to clean up municipal and indus-al pollution in the state in six years. The heart of e Program is the state's leadership in a plan ereby local, state, and federal governments are the cost of constructing interceptor sewers d sewage treatment plants. Changes in federal ancial assistance are proposed. The centraliza-n of water management at the state level is a key ctor in the progress thus far achieved. (See also 71-06910) (Smiljanich-Florida)
71-06912

TATEMENT OF ASSEMBLYMAN GEORGE M ORG,
eorge M. Borg.
Selected Papers and a Summary of the oceedings of Governor's Conference On Water sources Management, Madison, October 14 and , 1965. University of Wisconsin, Water sources Center, Madison, March 1966, p 68-69.

escriptors: *Wisconsin, *Water resources velopment, *Administrative agencies, *Water anagement (Applied), Legislation, State govern-ents, Local governments, Financing, Cost shar-g, Pollution abatement, Municipal wastes, Indus-al wastes, Sewage treatment, Legal aspects, eatment facilities, Research and development, doption of practices, Decision making, Institu-tions, Water policy, Grants, Administrative deci-sions.

Assembly Bill 875, which the author introduced into the Wisconsin State Legislature, would create an independent agency with central authority to consolidate all water-control functions. The new Department of Water Resources would be designed to promote the full utilization and conservation of the state's public waters. The Department and its director would be aided by a nine-man advisory committee representing various interests. The functions of the department would be: (1) to inspect all public water supplies and sewage systems and plants, (2) to approve construction plans for public plants and for control measures in private plants producing wastes, (3) to hold hearings and issue and seek enforcement of orders for the prevention or abatement of water pollution, (4) to sponsor research on the protection of water resources, and (5) to administer state and federal aid for pollution control. A program of state aid to local governments would be established by the Bill. Private industry and public and private agencies would be encouraged to conduct research on the problem of industrial wastes. Funding measures are also provided. (See also W71-06910) (Smiljanich-Florida)
W71-06913

WATER LEGISLATION IN THE 90TH CONGRESS.
League of Women Voters, Washington, D.C.

Water Resources Current Review No 5, February 1969. 16 p.

Descriptors: *Legislation, *Water resources, *Water resources development, *Federal government, Political aspects, Institutional constraints, Legal aspects, Erosion control, Estuaried, Nuclear powerplants, Desalination plants, Water pollution control, Water quality control, Grants, Apprioriations, Oil wastes, Financing, Pollution abatement, Flood plain insurance, Water policy, Sediment control, Sewage treatment, Ships, Regulation, Non-structural alternatives.
Identifiers: Scenic Rivers Act, National Water Commission Act, Colorado River Basin Project Act.

The merits, adequacy, and legislative history of water legislation of the 90th Congress are examined in this study. The prospects of future water resource legislation are also considered. Legislation passed by the 90th Congress includes: (1) the Colorado River Basin Project Act, (2) the Scenic Rivers Act, (3) the National Water Commission Act, (4) the flood insurance provision of the 1968 HUD Act, and (5) an Act authorizing an estuarine study. In addition, the Great Lakes Interstate Basin Compact and federal participation in the Bolsa Island nuclear generating and desalinization plant were approved. Despite passage, the Water Quality Improvement Act and the Oil and Hazardous Substances Pollution Act were not reported out of the conference committee due to the opposition of industrial lobbies. Legislation not considered by Congress, but examined by this study includes: (1) the Surface Mining Reclamation Act; (2) bills restricting vessel-sewage, mine-drainage, and lake pollution; and (3) sediment control bills. Included within the 'modest' water-resource appropriations were $214 million for sewage treatment, $165 million for water and lateral sewer programs, and $28 million for rural water and waste programs. (Earl-Florida)
W71-06914

AN EVALUATION OF THE PROVISIONS AND POLICIES OF THE OUTER CONTINENTAL SHELF LAND ACT,
Robert B. Krueger.
Natural Resources Journal, Vol 10, No 4, p 763-810, October 1970. 48 p, 174 ref.

Descriptors: *Administration, *Continental shelf, *Exploitation, *Leases, Public rights, Administrative agencies, Decision making, Administrative decisions, Regulation, Natural resources, Environmental effects, Project planning, Federal government, Continental slope, Continental margins, Institutional constraints, Coasts, Contracts, Offshore platforms, Federal project policy, Land use, Oil fields, Boundaries (Property), Legal aspects, Legislation.
Identifiers: *Outer Continental Shelf Lands Act.

The second installment of a two-part evaluation, this article examines the administration of the Outer Continental Shelf Lands Act. The policy objective of maximum benefit to the public is the criterion for the author's observations, analysis, and recommendations. This standard is a composite of: (1) efficient resource management, (2) the encouragement of private participation, (3) federal revenue maximization, (4) technological advancement, (5) encouragement of the multiple use of resources, and (6) environmental-quality protection. The article studies mineral leasing and considers: (1) the existing system of selecting areas for lease, (2) a case study of Santa Barbara, (3) new and proposed offshore regulations, (4) hard minerals, and (5) future developments. The author examines lease-sale size and timing determination. The article examines the existing system, alternative forms, and competitive versus non-competitive lease-allocation systems. The author's study includes the administrative determination of: (1) drilling and production requirements, (2) terms and royalties, and (3) entry requirements. An examination of miscellaneous problems encompasses: (1) boundaries and jurisdiction; (2) real property use; (3) geothermal and fresh water resources; (4) living seabed resources; (5) salvage and treasure recovery; (6) filling, dredging, and dumping; and (7) marine sanctuaries and scientific facilities. (Earl-Florida)
W71-06916

STATUTES AND REGULATIONS GOVERNING PRIVATE WATER WELL CONSTRUCTION AND PUMP INSTALLATIONS,
Wisconsin State Board of Health, Madison. Well Drilling and Sanitation Services.
T. A. Calabresa.
Groundwater, Vol 1, No 2, p 25-32, April 1963.

Descriptors: *Wisconsin, *Water wells, *Legal aspects, Drilling, Public health, Legislation, Ordinances, Statutes, Well regulations.
Identifiers: *Driller licensing, *Pump installer licensing.

The intent of this paper is to discuss the need for laws and regulations governing construction of wells for private water supplies. This will include: (1) why laws and regulations are necessary, (2) need for registration and licensing of drillers and pump installers, (3) how laws and regulations affect uniformity of construction and the desirability of such uniformity, (4) how they encourage the manufacture of new materials and group organization, (5) what a law and code should contain, (6) need of judgment in administering laws and the regulations adopted pursuant thereto, and (7) the difficulties in enforcing laws and regulations including budgetary reasons. The material presented is drawn from Wisconsin's 26 years of private water supply administration and in part from personal experience. Hence, all statements and conclusions made do not necessarily represent the thinking, views or practice of the author's employer. There is a definite need for control over the construction of private water supplies. This can best be accomplished by licensing of drillers and pump installers and the adoption of regulations for the location and construction of wells and the installation of pumps. Such controls will do much to preserve our most precious natural resource, groundwater, and to advance knowledge of the geologic and hydrologic characteristics of aquifers in a state. (Campbell-NWWA)
W71-06953

PROSPECTS FOR METROPOLITAN WATER MANAGEMENT,
American Society of Civil Engineers, Urban Water Resources Research Council, New York.
M. B. McPherson.
Copies available from ASCE, 345 E. 47th St., New York, N.Y. 10017, at $2.00 each. Urban Water Resources Research Council, December, 1970. 192 p, 12 fig, 7 tab, 4 append. OWRR Project C-1536 (No 1992) (5).

Descriptors: *Urban areas, *Water management (Applied), *Institutions of Government, *Administrative agencies, Urbanization, Local governments, Cities, Water policy, Water resources development, Social values, Economic efficiency, Public health, Ecology, Environment.
Identifiers: *Metropolitan, Water processes, Private corporations, Human biological needs, Roles of science and technology.

The report of a study which attempted to take into account: expectations for the environment of future cities; necessary or desirable new administrative arrangements for future public services management; and the expected impact and interaction of emerging technology, urbanization trends, social goals and related matters. The purpose of the study was to search for ways to make more effective use of technology in the improvement of urban living along with more effective allocation and use of metropolitan total fiscal resources. The objective, background, scope and format of the report comprise the first chapter. The text is summarized in Chapter 2, which also contains the conclusions and recommendations. The latter emphasize research needs. Coverage can be surmised from the titles of the remaining text chapters - 'Urbanization: Growth, Problems and Trends'; 'Human Biological and Social Needs; The Roles of Science, Technology and Private Corporations'; 'Metropolitan Physical and Governmental Structure'; 'Adaptations for Modifying Governmental Structure in the Metropolis'; 'Prospects for Governmental Reorganization in Metropolitan Areas'; 'Contemporary Metropolitan Water Management'; and 'Expected Directions in Metropolitan Water Management'. There are four appendices. Approximately 250 pages; over 200 references. (McPherson-ASCE).
W71-07053

AN EXPLORATION OF COMPONENTS AFFECTING AND LIMITING POLICYMAKING OPTIONS IN LOCAL WATER AGENCIES: PHASE II.
Colorado Univ., Fort Collins. Environmental Resources Center.

Available from National Technical Information Service as PB-198 428, $3.00 in paper copy, $0.95 in microfiche. Environmental Resources Center, Colorado State Univ, Fort Collins, Completion Report Series No 22, June 30, 1970. 115 p, 16 fig, 20 tab. OWRR Project B-029-COLO (5).

Descriptors: *Administration, *Constraints, *Decision making, Evaluation, Formulation, Institutional constraints, *Institutions, Local governments, *Methodology, Non-structural alternatives, Planning, *Rural areas, *Water users.

The perceptions, attitudes, orientations, and interaction patterns of water user publics are significant elements in local water systems. In an effort to locate at least one firm parameter of water systems, this research examines the attitudes, interaction, and other behavior of randomized samples of users of five local water agencies. Private and public agencies and rural and urban areas are included in the samples. The findings indicate that traditional, common sense classifications, such as private-public dichotomies or socio-economic classifications, have far less effect on public attitudes toward water agencies, than do volume, type, and content of communication. Systematic differences, however, are present between urban and rural users. Rural users tend to exhibit somewhat more positive images of water management and higher levels of satisfaction than do urban users. The data further indicate considerable, but no complete, independence of water systems from more general political systems. The linkages between systems are limited and occur only at selected points. Water system attitudes and behavior, however, are mutually associated in systematic and regular patterns across the samples. Communications about water with one's peers and the water management influence the water system strongly. The manner and form of influence or constraining effect may vary considerably, but a large amount of influence is consistently present. Generally, high peer discussion trafficks negative images of an agency, but images improve with each added increment of contact with management. Essentially, water systems have very low public visibility which impedes their capacity to sustain themselves.
W71-07054

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, NORTH BRANCH PENNSAUKEN CREEK, BURLINGTON COUNTY, NEW JERSEY.
Corps of Engineers, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W71-06517

FLOOD PLAIN INFORMATION, BIG COTTON INDIAN, LITTLE COTTON INDIAN, TAR AND PANTHER CREEKS - PART 1. METROPOLITAN ATLANTA, GEORGIA.
Corps of Engineers, Savannah, Ga.
For primary bibliographic entry see Field 04A.
W71-06522

6G. Ecologic Impact of Water Development

HYDROLOGICAL AND ENVIRONMENTAL CONTROLS ON WATER MANAGEMENT IN AN ARID URBAN AREA,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 04C.
W71-06597

WATER AND RELATED LAND RESOURCES - STATE ADMINISTRATION, LEGISLATIVE PROCESS AND POLICIES IN MINNESOTA, 1970,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 06E.
W71-06599

ENVIRONMENTAL LAW HANDBOOK,
For primary bibliographic entry see Field 05G.
W71-06600

CONSERVATION COMMISSIONS IN MASSACHUSETTS: WITH A SUPPLEMENTARY REPORT ON THE EMERGENCE OF CONSERVATION COMMISSIONS IN SIX OTHER NORTHEAST STATES,
Conservation Foundation, Wash., D.C.; and New England Conservation Services Center, Lincoln, Mass.
For primary bibliographic entry see Field 06E.
W71-06624

ENVIRONMENTAL IMPACT OF POWER PLANTS,
Corps of Engineers, Fort Belvoir, Va. Operations Div.
For primary bibliographic entry see Field 05C.
W71-06663

THE WATER WE LIVE BY--HOW TO MANAG IT WISELY,
National Academy of Sciences, Washington, D.C.
L. A. Heindl.
New York, NY, Coward-McCann Publisher $4.29, 1970. 127 p.

Descriptors: *Water resources developmen *Water demand, *Water conservation, *Wat pollution, *Water utilization, Surface wate Groundwater, United States, Earth (Planet), Wat quality, Water supply, Reviews.

Basic principals of the sound management of wat are outlined, and specific examples of the difficu ties which can result when these principles a ignored are cited. Also included are the relatio ship of water use and development, and the poll tion of America's rivers and Great Lakes; t recent drought in New York State; the ecologic problems of the Everglades; the dilemmas arisi from irrigation of larger and larger areas of ar land; and the need to develop more hydroelectr power, while at the same time preserving lar areas of wilderness for wildlife and recreatio (Woodard-USGS)
W71-07038

07. RESOURCES DATA

7A. Network Design

SPECTRAL ANALYSIS - A PROTOTYPE ST DY,
Bureau of Reclamation, Denver, Colo.
H. T. Falvey, and D. L. King.
Paper presented at the American Society of Ci Engineers Annual Hydraulics Division Conferen Logan, Utah, August 20-22, 1969. 9 p, 8 fig, 1 t 4 ref.

Descriptors: *Frequency analysis, *Turbulen *Stilling basins, Vortices, Jets, Outlets, Hydrau structures, Hydraulics, Instrumentation, Calib tion, Piezometers.
Identifiers: *Spectral analysis.

Many critical areas should be considered wh planning and performing spectral analyses of fl tuating signals. An important consideration planning the analysis is determining how the resu will be used. The analysis of data representing fl tuating water pressures in a prototype stilling ba was used to illustrate these considerations. Accu cy of the analyses should be consistent with des requirements. The equipment used was limited the analysis of the frequency-amplitude spectr at a single point on the structure. The capabilit and limitations of the commercially available strument that was used in this study are discuss Calibration procedures are described. The pro type stilling basin was designed to dissipate energy of high-velocity flow from 2 hollow valves. The basin was covered and the divider w was supported at both top and bottom, provid the opportunity to measure the pressures with significant modification by flexure of the wall. napp-USGS)
W71-06511

EFFICIENCY OF HYDROLOGIC DATA CO LECTION SYSTEMS, ROLE OF TYPE I AND ERRORS,
Arizona Univ., Tucson. Dept. of Systems Engine ing.
Lucien Duckstein, and Chester C. Kisiel.
Research Report, Presented before Sixth Ameri Water Resources Conference, Las Vegas, Neva October 1970. 23 p, 2 fig, 18 ref. OWRR Project 007-ARIZ (6).

Descriptors: *Hydrologic data, *Mathemat models, *Statistical methods, *Risks, *Grou water recharge, Costs, Efficiencies, Optimizati Decision making.
Identifiers: *Null hypothesis.

e purpose of this paper was to: review the overall
oblem of evaluating the efficiency of hydrologic
a collection systems, present a mathematical
sis for evaluating the relationship of risk Type I
d Type II errors to one or more increments of
a, and present examples. Identified were four
ects of error or risk: (a) choice of mathematical
del for the same process, (b) accuracy and
cision of parameter estimates, (c) acceptance of
ng hypothesis or rejection of correct hypothes-
and (d) economic losses associated with error.
these four, the classical hypothesis testing
oblem was specifically evaluated in terms of costs
ociated with producer's (Type I) or consumer's
pe II) errors for simple and composite
otheses. Mathematical models for these
nomic analyses included costs of sample data
d costs of waiting while new data was obtained.
illustrative computational example focused on
hypothesis that natural recharge might be aug-
nted by a system of pumping wells along an
nemeral channel. The relationship of the
othesis testing problem to Bayesian decision
ory was discussed; it was felt that the latter
ory offered a more comprehensive framework
design and use of hydrologic data networks.
e also W71-06577 thru W71-06580) (Kriss-
rnell)
1-06576

FICIENCY OF PARAMETER AND STATE TIMATION METHODS IN RELATION TO ODELS OF LUMPED AND DISTRIBUTED DROLOGIC SYSTEMS,
zona Univ., Tucson. Dept. of Hydrology and
ter Resources.
ester C. Kisiel.
search Report, January 1971. 26 p, 67 ref.
/RR Project B-007-ARIZ (8).

scriptors: *Hydrologic data, *Parametric
drology, *Mathematical models, *Statistical
thods, *Efficiencies, *Estimating, Risks, Dis-
ution systems, Frequency analysis.
ntifiers: *Lumped parameter models.

ur classes of errors, considered in problems of
l-time control of hydrologic systems, were
cribed as: (a) system representation, (b)
ameter estimation, (c) truncation (in the ap-
ximation of model equations), and (d) roundoff
the use of computers). Of prime concern was a
iew of the important philosophical and practical
ies inherent in system representation and
ametric estimation errors. Included in these two
sses of error were (a) representation problem,
l (b) identification problem. A detailed discus-
n of the identification problem and its relation to
imization theory and statistical estimation
ory was given. System determinancy and in-
erminancy was defined in terms of the number
variables, data points, and equations and
borated in terms of design, identification and
ameter estimation problems. Issues involved in
osing among models were: model validation,
arent and inherent randomness, and lumped
l distributed parameter models interpreted by a
quency domain method. A heat flow problem
s modeled by the latter methods and interpreted
autocorrelation and spectrum functions for the
ped model. A outline of Bayesian decision
ory was presented and applied to evaluating the
t of uncertainty in the design of bridge piers.
certainty existed in the mean and variance of the
-normal distribution used to describe annual
k flows in Rillito Creek in Tucson, Arizona.
e also W71-06576) (Kriss-Cornell)
1-06577

ROR ANALYSIS AND SYSTEM IDENTIFI-TION OF WATER BALANCE AND THE INFALL EXCESS COMPONENT IN REAL D MODEL WATERSHEDS,
zona Univ., Tucson. Dept. of Hydrology and
ter Resources.
r primary bibliographic entry see Field 06A.
1-06578

REMOTE 'EYES AND EARS' FOR FLOOD WARNINGS,
Corps of Engineers, Boston, Mass. New England Div.
Frank P. Bane.
The Military Engineer, Vol 63, No 411, p 19-20, January-February, 1971. 2 p.

Descriptors: *Flood control, *Flood forecasting, *Remote sensing, *New England, *Coasts, Hurricanes, Sea water, Hydrologic data, Instrumentation, Methodology, Coastal structures, Wind tides, Computers, Meteorological data, Data transmission, Harbors, Network design, Saline water intrusion, Warning systems.
Identifiers: Flood warnings.

Protection of major port cities in New England which had been repeatedly wrecked by hurricane winds and ocean surges was provided by four barriers against hurricane-induced tidal flooding. To achieve the greatest operating benefits from this protection system, the Automatic Hydrologic Radio Reporting Network has been installed. Accurate and timely regulation of the dams and barriers require hydrologic data which include river, reservoir, and tidal levels; wind velocity and direction; barometric pressure; and precipitation. Many of the remote stations of the system are located in gaging stations operated by the Geological Survey for measuring stream flow. The Network consists of 41 remote reporting stations, 5 remote recording stations, and a central control station at Division headquarters plus 12 repeater and 4 relay points. The operation of the control system is discussed. (Woodard-USGS)
W71-06661

SPATIAL CORRELATIONS OF STORM, MONTHLY AND SEASONAL PRECIPITATION,
F. A. Huff, and W. L. Shipp.
J Appl Meteorol, Vol 8, No 4, p 542-550, Aug 1969. 7 diag, 6 tab, 1 graph, 7 ref.

Descriptors: *Precipitation, *Measurement, *Statistical models, *Rainfall disposition, *Spatial distribution, *Correlation analysis, *Storms, *Rainfall intensity, *Illinois.

One approach to defining sampling requirements for precipitation measurement networks is through statistical correlation methods. Data from three dense rain gage networks in Illinois were used with this method on rainfall measurements ranging from 1-minute rates to total storm, monthly and seasonal amounts. Effects of rain type, synoptic storm type, and other factors on spatial correlations were studied. Correlation decay with distance used to indicate sampling requirements was greatest in thunderstorms, rain showers and air mass storms. Conversely, minimum decay occurred with steady rain and the passage of low pressure centers. Seasonally, the decay rate is much greater in May-September storms than in cold season precipitation. Sampling requirements are extreme in measuring rainfall rates; thus, assuming a minimum acceptance of 75% explained variance between sampling points, a gage spacing of 0.3 minutes is needed for 1-minute rain rates compared with 7.5 minutes for total storm rainfall in summer storms.
W71-06968

7B. Data Acquisition

USE OF SIDE-LOOKING AIR-BORNE RADAR FOR SEA ICE IDENTIFICATION,
Coast Guard, Washington, D.C. Applied Sciences Div.
Jimmie D. Johnson, and Dennis L. Farmer.
Journal of Geophysical Research, Vol 76, No 9, p 2138-2155, March 20, 1971. 18 p, 14 fig, 4 ref.

Descriptors: *Remote sensing, *Radar, *Ice, *Sea ice, Arctic, Icebergs, Navigation, Freezing, Ice jams, Warning systems.
Identifiers: Side-looking radar.

An experiment was conducted to assess the performance of side-looking air-borne radar (SLAR) in mapping and identifying sea ice parameters. A Philco-Ford AN/DPD-2 (Modified) SLAR was installed on a Coast Guard C-130 aircraft and flown on an experimental basis during September 1969 in conjunction with the S.S. Manhattan's transit of the Northwest Passage. The SLAR was also used as a routing aid to the Manhattan. SLAR can readily be used to detect ice concentrations, floe size and number, and water openings, and to identify, through careful image interpretation, ice age, ice drift, surface topography, fractures, and pressure characteristics. SLAR's broad areal coverage, all weather day and night capability make it an effective means of observing sea ice, and for many purposes it provides observations superior to information obtained by a visual ice observer. SLAR imagery can be used in research efforts to study the formation, growth, and decay of sea ice and can be used operationally for ship routing and ice forecasting. (Knapp-USGS)
W71-06470

COMPARATIVE STUDY OF ELECTRICAL CONDUCTIVITY PROBES,
Iowa Univ., Iowa City. Iowa Inst. of Hydraulic Research.
Carlos V. Alonso.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 1, p 1-10, 1971. 10 p, 5 fig, 1 tab, 8 ref. NSF Grant GK-2818; FWQA Grant WP-1218-01.

Descriptors: *Tracers, *Electrolytes, *Electrical conductance, *Instrumentation, Calibrations, Flow, Density, Tracking techniques, Conductivity, Water chemistry.
Identifiers: Electrical conductivity probes.

The use of conductivity probes for measuring fluid movement through the corresponding changes in the electrical conductivity of a tracer substance (aqueous sodium chloride solution) is considered. A comparative description is given of the characteristics of several conductivity probes of different sizes and configurations. In order to compare the response of the different types of probes, they were tested under the same experimental conditions. In addition, tests were conducted to determine how much influence, if any, the orientation of the probes has on the conductivity measurements, and, finally, their response times were evaluated. (Knapp-USGS)
W71-06477

MEASURING ILLUMINATION WITHIN SNOW COVER WITH CADMIUM SULFIDE PHOTO RESISTORS,
Forest Service (USDA), Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 02C.
W71-06495

THE UNIVERSITY OF ARIZONA'S GRAVITY SURVEY PROGRAM,
Arizona Univ., Tucson. Geophysics Lab.
J. S. Summer, and R. E. West.
EOS (American Geophysical Union Trans) Vol 50, No 10, p 541-542, October 1969. 2 p, 3 fig, 5 ref. OWRR Project A-008-ARIZ (3).

Descriptors: *Gravity studies, *Surveys, Structural geology, Aquifers, Alluvium, Alluvial channels, Land subsidence, Water levels, Water table, Recharge, Groundwater movement, Mapping, Maps, Arizona, Water resources research act.
Identifiers: *Gravity surveys.

The Geophysics Laboratory at the University of Arizona has a continuing interest in making and analyzing gravity measurements over the state. Planning has started on compilation of an Arizona 1:500,000 scale gravity map to accompany the state geologic and magnetic maps. To date over 3000 gravity stations have been taken and com-

piled by the University of Arizona. Interpretation of gravity data for the purpose of determining subsurface structural conditions continues to be an important practical and academic subject in this region. In the Basin and Range province to the west, surveys are useful in outlining pediment edges obscured by alluvial cover, and in determining the depth of sedimentary alluvial basins. It is important to know where pediment edges are for purposes of exploration for minerals and groundwater. Also, pediment edges form a zone of soil instability because basin sediments subside with groundwater withdrawal. Another use of gravity measurements that is being developed is the technique of resurveying points established near occasional streams, for the purpose of learning about variations in subsurface water levels. Gravity differences can be related to differences in the amount of subsurface water caused by seasonal changes or nearby pumped wells. (Knapp-USGS)
W71-06504

METHODS AND APPLICATIONS OF ELECTRICAL SIMULATION IN GROUNDWATER STUDIES IN THE LOWER ARKANSAS AND VERDIGRIS RIVER VALLEYS, ARKANSAS AND OKLAHOMA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02F.
W71-06507

GRAVIMETRIC ICE THICKNESS DETERMINATION, SOUTH CASCADE GLACIER, WASHINGTON,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 02C.
W71-06508

DETERMINATION OF CARBONATE SATURATION OF SEAWATER WITH A CARBONATE SATUROMETER,
California Univ., Los Angeles, Dept. of Geology; and California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
S. Ben-Yaakov, and I. R. Kaplan.
Limnology and Oceanography, Vol 14, No 6, p 874-882, November 1969. 9 p, 5 fig, 3 tab, 19 ref. USAEC Contract AT (11-1)-34, Project No 178.

Descriptors: *Water chemistry, *Carbonates, *Chemical potential, *Sea water, *Saturation, Equilibrium, Hydrogen ion concentration, Instrumentation, Calibration, Laboratory tests, On-site tests, Calcium carbonate, Chemical precipitation.
Identifiers: *Carbonate saturometers.

A mathematical model was established for the implementation of the Weyl saturometer, to obtain quantitative data on the degree of saturation of calcite and aragonite to within 2% when the chlorinity and pH of the measured seawater are known. The method also enables carbonate alkalinity to be estimated to within 10% of values obtained by titration. Nomograms are given for the determination of degree saturation and total CO2 for seawater of known pH, where a change in potential is measured after exposing a calibrated glass electrode to a slurry of calcium carbonate in the original seawater. (Knapp-USGS)
W71-06513

THE DETECTION OF MAGNETIC FIELDS CAUSED BY GROUNDWATER AND THE CORRELATION OF SUCH FIELDS WITH WATER DOWSING,
Utah Water Research Lab., Logan.
Duane G. Chadwick, and Larry Jensen.
Available from NTIS as PB-198 343, $3.00 in paper copy, $0.95 in microfiche. Utah Water Research Laboratory Report PRWG 78-1, January 1971. 57 p, 27 fig, 8 tab, 9 ref, 2 append. OWRR Project B-033-UTAH (1). Matching Grant Agreement No. 14-31-0001-3133.

Descriptors: *Dowsing, *Groundwater, *Magnetic studies, *Water sources, Water wells, Statistical methods, Equipment, Test procedures.
Identifiers: *Water witching, *Dowsing techniques, Dowsing tests.

Perturbations on the earth's magnetic field may coincide with groundwater bodies; various geologic formations have differing magnetic signatures. Some of the formations are water bearing; some are not. The magnetic field perturbations were plotted and numerous independent, individual dowsing tests were made at 4 principal locations. Objective was to see if water dowsers (1) obtain results which are independently corroborative and (2) obtain results which correlate in some way with magnetic field plots of the dowsed areas. About 150 people participated in the experiment over a one year period. Chi-square tests show considerable statistical significance. Nearly all the people involved in the project experienced dowsing reactions though most had never dowsed before. Some evidence exists of correlation between magnetic gradient changes and dowsing reactions. Concern is expressed that this report may be used to prove dowsing is an effective means of finding water if certain statements are taken out of context. It is emphasized that no wells were dug, tests by a few experienced dowsers did not have results better than novices, and only by statistics was it shown that some kind of undefined information might be present. (Lang-USGS)
W71-06655

FIELD OBSERVATIONS ON THE USE OF SODIUM CYANIDE IN STREAM SURVEYS,
Tennessee Game and Fish Commission
For primary bibliographic entry see Field 05C.
W71-06724

THE NUCLEAR METHOD OF SOIL-MOISTURE DETERMINATION AT DEPTH,
Texas Univ., Austin. Center for Highway Research.
For primary bibliographic entry see Field 02G.
W71-06779

A NUMERICAL INVESTIGATION OF TIDAL CURRENT CIRCULATION IN THE GULF OF MAINE,
Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 02L.
W71-06801

A NEW TECHNIQUE FOR SOIL STRAIN MEASUREMENT,
For primary bibliographic entry see Field 08D.
W71-06841

RAPID MEASUREMENT OF DRAINAGE DENSITY,
Kentucky Univ., Lexington. Dept. of Geography.
For primary bibliographic entry see Field 04A.
W71-07010

ON THE POSSIBILITY OF USING METEOROLOGICAL SATELLITE OBSERVATIONS FOR THE STUDY OF ANTARCTIC ICE,
P. Glade, H. Gernandt, and V. A. Shamont'yev.
Translated from Informatsionnyi Byulleten' Sovetskoi Antarticheskoi Ekspeditsii, No 73, p 27, 1969. Soviet Antarctic Expedition Information Bulletin, Vol 7, No 4, p 296-299, February 1971. 4 p, 3 fig, 3 ref.

Descriptors: *Aerial photography, *Antarctic, *Satellites (Artificial), Remote sensing, Ice, Glaciers, Coasts, Icebergs, Surveys, Mapping.
Identifiers: *Antarctic ice.

Meteorological satellite observations can aid in the study of antarctic ice. The photographs taken by the satellite from an altitude of about 1000 km depict areas of the earth's surface measuring approximately 2500 x 2500 km, and the scale of the photographs is close to 1:15,000,000. The satellite photographs clearly show the configuration of the coastline. Meteorological satellite observations show great promise for the study of antarctic ice. The information received from satellites is an additional source of data concerning the variations in the general position of the antarctic ice shore needed for the study of the mass balance of the Antarctic ice sheet. The recording of large icebergs on photographs over a long period of time will help refine their drift trajectories in antarctic waters. These data can be used for the observation of large accumulations of fast and drift ice off the coast of Antarctica. (Knapp-USGS)
W71-07023

A STUDY OF THE WATER BALANCE OF A NATURAL CATCHMENT USING A NEUTRON SCATTERING MOISTURE METER,
Road Research Lab., Crowthorne (England).
For primary bibliographic entry see Field 02D.
W71-07042

GAMMA-RADIATION DETECTION OF WATER CONTENT IN TWO-DIMENSIONAL EVAPORATION PREVENTION EXPERIMENTS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 02D.
W71-07044

7C. Evaluation, Processing and Publication

AN AUTOMATIC RECORDING FIELD STATION FOR COLLECTING ENVIRONMENTAL DATA,
Geological Survey, Arlington, Va.
Wallace M. Yater, Jr.
BioScience, Vol 21, No 1, p 11-15, January 1971. 5 p, 5 fig, 3 ref.

Descriptors: *Data collections, *Hydrology, *Remote sensing, *Automation, *Data transmission, Soil moisture, Rainfall, Temperature, Instrumentation, Electrical resistance, Methodology, Data processing, Data storage and retrieval, Computers, Equations, Computer programs.
Identifiers: Digital tape, Magnetic tape.

An automated system for recording soil moisture, rainfall, temperature, and microchanges in tree radius in several different type habitats is described. The data are punched on paper tape which can be transcribed to magnetic tape for computer use. All of the sensors were designed so that their electrical resistance would vary over all or part of a 0 to 41,000 ohm range. This matching of the resistance ranges of the sensors to the measuring circuit permits the same Wheatstone bridge circuit to measure all of the sensors. The same servo motor that balances the bridge simultaneously positions to digit cams of a Fischer and Porter digital recorder, which punches a four-digit binary decimal number in 16-channel paper tape at the end of the balancing cycle. A 6-volt battery drives the bridge balancing, primary step switch, and digital punch mechanism motors, while a 12-volt battery powers the transistor amplifier and the bridge and actuates the solenoids in the Leds secondary step switches. The system cost about $4800 in 1968. This includes the bridge servo, digital recorder, sensors (excepting dendrometer for the tree radius measurement), and payment to a private contractor to design and construct the bridge, switching system, instrument and battery shelters, and junction boxes. (Woodard-USGS)
W71-06467

ON THE SOLUTION OF TRANSIENT FREE SURFACE FLOW PROBLEMS IN POROUS MEDIA BY FINITE-DIFFERENCE METHODS,
Oslo Univ. (Norway). Inst. of Geophysics.
For primary bibliographic entry see Field 02F.
W71-06471

FINITE DIFFERENCE SOLUTION OF THE FLOOD DIFFUSION EQUATION,
Birmingham Univ. (England). Graduate School of Water Resources Technology; Birmingham Univ. (England). Dept. of Civil Engineering; and Essex River Authority (England).
For primary bibliographic entry see Field 02E.
W71-06472

GROUNDWATER FLOW IN HETEROGENEOUS, ANISOTROPIC FRACTURED MEDIA: A SIMPLE TWO-DIMENSIONAL ELECTRIC ANALOG,
Centre d'Hydrogeologie, Neuchatel, Switzerland. Geological Institute.
For primary bibliographic entry see Field 02F.
W71-06475

QUANTITATIVE SLOPE ASPECT DETERMINATION,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
C. B. England.
Journal of Hydrology, Vol 12, No 3, p 262-268, February 1971. 7 p, 5 fig, 1 tab, 3 ref.

Descriptors: *Terrain analysis, *Mapping, *Slopes, *Topography, Small watersheds, Profiles, Surveys, Evapotranspiration, Maps, Geomorphology.
Identifiers: *Slope determination.

A rapid and efficient method is described for quantifying slope exposure using only a T-square and triangle on a topographic map. Results of aspect determination using this technique on a small Wisconsin watershed are compared with those obtained by point sampling. Since the proposed method accurately defines the boundaries between aspect units, and requires less than one-third the time, it has distinct advantages over point sampling, which can erroneously define the boundaries. Proposed use of this method is to derive aspect parameters for a watershed evapotranspiration model. (Knapp-USGS)
W71-06476

APPLICATIONS OF INFORMATION AND GRAPH THEORY TO MULTIVARIATE GEOMORPHOLOGICAL ANALYSES,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research; and Colorado Univ., Boulder. Dept. of Geological Science.
J. T. Andrews, and G. Estabrook.
Journal of Geology, Vol 79, No 2, p 207-221, March 1971. 15 p, 4 fig, 10 tab, 19 ref. NIH Grant GM 13974; ONR Contract Nonr 3640 (00).

Descriptors: *Statistical methods, *Geomorphology, Correlation analysis, Stochastic processes, Surveys, Digital computers, Particle shape, Topography, Glacial drift, Probability.
Identifiers: *Graph theory, *Baffin Island (Canada).

Some methods of examining the interrelationships among variables (R-mode) and among individual objects (Q-mode) require measurements on an interval or ratio scale, and are frequently not useful in many geomorphological studies where lower measuring scales are employed. By contrast, the information- and graph-theory methods use nominal scale data. Their use is illustrated by a discussion based on a 41 (objects) X 12 (variables) matrix relating to the cross-valley moraines of Baffin Island. The variables measure moraine shape, location, till fabrics, and clast roundness. The information-theoretic approach generates a measure of distance and computes the amount of shared information between the variables. Unconditional and conditional probability tables are used to assess the stochastic dependence among states of two variables. Graph-theoretic methods are used to develop a measure of similarity that is then used in a classification of the moraines. The characters that share most information are two measures of clast roundness and the dip pattern of till fabric. Two classifications are developed that share considerable information with moraine shape and location within the valley; 'hooked' and 'asymmetric' moraines were found to be quite different from each other. Since the techniques use nominal data, they should have general applicability in several fields of geology. (Knapp-USGS)
W71-06486

WATER RESOURCES OF SPARTANBURG COUNTY, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
For primary bibliographic entry see Field 02E.
W71-06487

SUMMARY OF DATA ON CHEMICAL QUALITY OF STREAMS OF NORTH CAROLINA, 1943-1967,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02K.
W71-06489

EXPERIMENTAL PROGRAM FOR ANALYSIS AND VALIDATION OF WATERSHED MODELS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 06A.
W71-06580

LEAST COST SAND FILTER DESIGN FOR IRON REMOVAL,
Iowa State Univ., Ames. Dept. of Civil Engineering; and Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 05D.
W71-06585

HEC-3 RESERVOIR SYSTEM ANALYSIS.
Corps of Engineers, Davis, California. Hydrologic Engineering Center.
For primary bibliographic entry see Field 04A.
W71-06586

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA THROUGH SEPTEMBER 1970,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 02E.
W71-06667

DRAINAGE AREA STATISTICS FOR THE CHESAPEAKE BAY FRESH-WATER DRAINAGE BASIN,
Johns Hopkins Univ., Baltimore, Md., Chesapeake Bay Inst.
For primary bibliographic entry see Field 02E.
W71-06668

RECONNAISSANCE OF SELECTED MINOR ELEMENTS IN SURFACE WATERS OF THE UNITED STATES, OCTOBER 1970,
Geological Survey, Washington, D.C.
W. H. Durum, J. D. Hem, and S. G. Heidel.
Free on application to the US Geological Survey, Washington, DC 20242. Geological Survey Circular 643, 1971. 49 p, 6 fig, 1 tab, 3 ref.

Descriptors: *Trace elements, *Water analysis, *United States, *Puerto Rico, *Water chemistry, Sampling, Rivers, Lakes, Laboratory tests, Chemical analysis, Cobalt, Chromium, Data collections, Surface waters, Water supply, Natural streams, Industrial wastes, Municipal wastes.
Identifiers: *Mercury, Arsenic, Cadmium, Lead, Zinc.

A nationwide reconnaissance of selected minor elements in water resources of the 50 States and Puerto Rico was made by the U.S. Geological Survey in cooperation with the U.S. Bureau of Sport Fisheries and Wildlife during autumn, 1970. The more than 720 samples collected from rivers and lakes were analyzed for arsenic, cadmium, chromium (hexavalent), cobalt, lead, mercury, and zinc. A summary of the results for each element is given and analytical results are tabulated. Data on mercury are reported in two forms: dissolved and total. The concentration of the dissolved form is an indication of what might occur in a treated or filtered water supply at the same sampling point. Total mercury represents the amount in the water-sediment mixture. In none of the dissolved mercury samples did the concentration exceed the proposed Public Health Service upper limit for dissolved mercury in drinking water, which is 5 millionths gram per liter. Total mercury was found in excess of this concentration in a few instances. (Woodard-USGS)
W71-06670

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 2. SOUTH ATLANTIC SLOPE AND EASTERN GULF OF MEXICO BASINS.
Geological Survey, Washington, D.C.

For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, as I19.13:1904, Price $4.25. Geological Survey Water-Supply Paper 1904, 1970. 942 p, 1 fig, 1 plate.

Descriptors: *Surface waters, *Streamflow, *Flow measurement, *Stream gages, *Gaging stations, Data collections, Flow rates, Average flow, Low flow, Peak discharge, Lakes, Reservoir stages.
Identifiers: *South Atlantic slope, *Eastern Gulf of Mexico basins, Stream discharge, Flow extremes, Crest stage.

This volume is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1961-65 water years. The data reported comprise a description of the gaging station, and tables showing the daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gages, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. Data for partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W71-06674

THE KANSAS CITY DISTRICT SUSPENDED SEDIMENT LOAD COMPUTER PROGRAM,
Corps of Engineers, Kansas City, Mo.
For primary bibliographic entry see Field 02J.
W71-06685

CURRENT DUTCH PRACTICE FOR EVALUATING RIVER SEDIMENT TRANSPORT PROCESSES,
Corps of Engineers, St. Paul, Minn. Reservoir and Hydrologic Engineering Section.
For primary bibliographic entry see Field 02J.
W71-06686

WATER TEMPERATURES OF CALIFORNIA STREAMS, NORTH COASTAL SUBREGION,
Geological Survey, Menlo Park, Calif.
J. C. Blodgett.
Geological Survey Open-file Report, July 6, 1970. 92 p, 4 fig, 1 tab, 24 ref.

Descriptors: *Water temperature, *Streams, *Data collections, *Hydrologic data, *California, Fluctuation, Average flow, Gaging stations, Thermometers, On-site data collections, Frequency.
Identifiers: *Northwestern California, Thermograph stations, Daily measurements.

A summary of water-temperature records is presented for data collected through September 1968 in the North Coastal Subregion of California. This report is one of a series covering the 11 hydrologic subregions of the State and includes data for 120 stream sites. Water temperatures, in degrees Celsius, are summarized by months, years, and for the period of record. A description is included to identify each station where data were collected. A tolerance interval analysis indicates that 99 percent of the point water-temperature observations, determined either with thermograph probes or hand-held thermometers, should be within 1.1 deg F of the mean water temperature at the 95-percent confidence level. The summary data for each site may be used to provide guidelines for the establishment of thermal standards used in water-quality management. (Woodard-USGS)
W71-06699

FINITE ELEMENT SOLUTION OF STEADY STATE POTENTIAL FLOW PROBLEMS--THE HYDROLOGIC ENGINEERING CENTER GENERALIZED COMPUTER PROGRAM 723-G2-L2440.
Corps of Engineers, Davis, Calif. Hydrologic Engineering Center.

Army Corps of Engineers Hydrologic Engineering Center Report, November 1970. 48 p, 22 fig, 3 tab, 22 ref, 5 append.

Descriptors: *Model studies, *Groundwater movement, *Steady flow, *Potential flow, *Computer programs, Porous media, Mathematical models, Equations, Data storage and retrieval, Programming languages, Darcys law, Hydrogeology, Hydraulics, Hydraulic conductivity, Flow characteristics, Boundaries (Surfaces), Pressure, Dynamics, Velocity, Hydraulic gradient.

This computer program is intended for application to problems involving steady, two-dimensional or axisymmetric flow through heterogeneous, anisotropic porous media of virtually any internal or external geometry. Although the program was developed primarily with groundwater and seepage problems in mind, it is equally applicable to potential flow problems of any type, such as those involving heat conduction or electric potential distribution. The basic equations that are solved numerically by the finite element method are derived on the basis of a number of assumptions as to the physics of motion and achievement of continuity of mass. These equations include the differential form of Darcy's Law, the continuity equation, and derived basic flow equations. This program uses the finite element numerical method to solve second order, linear partial differential equations, and associated boundary conditions. The program as dimensioned can handle up to 400 nodes, 400 elements, 20 conductivity zones, 100 specified nodal values of potential, 200 sources or sinks and 100 known-flow boundaries. It occupies about 31,000 words of core on a CDC 6600 computer. Each input card is described in detail, and a summary of input cards is included. (Woodard-USGS)
W71-06701

HYDROLOGY ANNUAL NO 14 - 1966.
Soil Conserv and Rivers Control Council Annual Hydrol Rep, 1968. 247 p, 5 fig, 19 ref.

Descriptors: *Data collections, *Hydrologic data, *Bibliographies, Streamflow, Stream gages, Snow surveys, Snow cover, Low flow, Floods, Discharge (Water), Recession curves, Sediment load, Suspended load, Water quality, Channel morphology, State-discharge relations.
Identifiers: *New Zealand.

Hydrologic data collected at 25 stations in New Zealand in 1966 are tabulated. Collected data include a list of streamflow stations, precipitation gages, sediment gages, water quality stations, snow courses, groundwater observation sites, representative and experimental basins, streamflow tables, snow survey data, recession curves, suspended sediment rating curves, water quality data, flood data, and channel morphology and efficiency surveys. An annotated bibliography of hydrological papers about New Zealand and by New Zealand authors is included. Addresses of all local hydrological and meteorological authorities and agencies collecting data are also included.
W71-06962

RAIN-GAUGING PROGRAM TO PROVIDE GUIDE TO STORM SEWER DESIGN,
For primary bibliographic entry see Field 08B.
W71-06964

A SHORTCUT FOR COMPUTING STREAM DEPLETION BY WELLS USING ANALOG OR DIGITAL MODELS,
Geological Survey, Denver, Colo.
O. James Taylor.
Groundwater, Vol 9, No 2, p 9-11, March-April 1971. 3 p, 2 fig, 2 tab, 4 ref.

Descriptors: *Surface-groundwater relationships, *Mathematical models, *Computer programs, *Analog models, Simulation analysis, Withdrawal, Drawdown, Recharge, Aquifers, Hydrogeology, Aquicludes, Alluvial channels.
Identifiers: Alluvial aquifers.

Theory indicates that the effect of a discharging well on streamflow in a stream-aquifer system is independent of the length of the reach. The theory was verified using a digital computer model of short and long reaches of a stream-aquifer system. The theory was extended successfully to a heterogeneous stream-aquifer system having sinuous boundaries where the stream was reasonably straight. Within tested limits, a model of a short reach will give results comparable in accuracy to one of a long reach with considerably less effort and expense. (Knapp-USGS)
W71-07006

GROUNDWATER FLUCTUATIONS IN RESPONSE TO ARBITRARY PUMPAGE,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02F.
W71-07007

COMPUTER ORIENTED STABILITY ANALYSIS OF RESERVOIR SLOPES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 08D.
W71-07058

08. ENGINEERING WORKS

8A. Structures

DROP INLET REPAIRS STORMS DAMAGE TO SEWER SYSTEM.
For primary bibliographic entry see Field 05G.
W71-06544

RX FOR . . . .
For primary bibliographic entry see Field 05G.
W71-06550

URBAN RENEWAL IN WHITE PLAINS, NEW YORK,
J. Michael Divney.
Civil Eng, Vol 39, No 9, p 69-72, Sept 1969.

Descriptors: *Urban renewal, Storm drains, New York.
Identifiers: *White Plains (NY).

In an urban renewal program in White Plains, N. Y., a scatter housing plan was developed. A scheme employing pairs of one-way streets and at-grac tersections was used. The Davis Brook storm (84 in. diameter, 3000 ft. long) will divert the of the David Brook culvert from the center c project to the Bronx River, along the sou boundary of the project. The pipes were ja under the commuter rail line, and gravel pumped into the voids, thus stopping the trac tlement.
W71-06556

HANDBOOK OF STEEL DRAINAGE HIGHWAY CONSTRUCTION PRODUCTS.

Am Iron Steel Inst, New York, NY, 1967. 382

Descriptors: *Drainage, *Construction, *D data, *Design, *Steel, *Steel structures, *Ins tion, *Application methods, Construction m als, Construction equipment.

The main purpose of this handbook is to ai gineers in overcoming problems involve highway, railway, municipal, agricultural, ar dustrial drainage and construction. The text ai present engineering practices based on sixty of practical experience compatible with ex technology. Design data and designed aids are extensively, while theory is kept at a minimum design and application of flexible steel derground conduits, plus good installation tices, are described in the first two parts o book. The third part concerns other steel pro for related construction. The first part on ge design considerations includes chapters product details, strength design, service hydraulics, cost factors, couplings and fittings installation instructions. Part II on applic covers the following subjects: culverts, sewers drainage, airport drainage, erosion preve dam and levee drainage, tunnels, shafts, cai underpasses, and service tunnels. The book contains a glossary of terms, a list of symbols version tables, general tables, and gage/heig cover tables. (See also W71-06640 thru 06648)
W71-06639

HANDBOOK OF STEEL DRAINAGE HIGHWAY CONSTRUCTION: CHAPTER PRODUCT DETAILS.
Am Iron Steel Inst, New York, NY, p 10-37, 14 fig, 22 tab, 14 ref.

Descriptors: *Underground structures, *Con *Steel, *Analysis, Steel structures, Design, St drainage, Subsurface drainage, Bypasses.
Identifiers: Storm sewers.

This chapter studies product details involv design of flexible steel underground con Design factors are listed, and the book ele begin with an analysis of the required strengt tor of the conduit wall. The background of gated steel conduits is given as well as spe tions in common use; a description of corruga sectional properties, pipe seams, and shapes o duits; data on structural plates that are field a bled, and on bolts and nuts, and arch channel following three principal types of undergoun duits are introduced: (1) conduits for s drainage, such as culverts, storm sewers stream enclosures; (2) conduits for subdraina controlling underground water; and (3) co for traffic underpasses, and service passes. also W71-06639)
W71-06640

HANDBOOK OF STEEL DRAINAGE HIGHWAY CONSTRUCTION: CHAPTER STRENGTH DESIGN.
American Iron and Steel Inst., New York.

Am Iron Steel Inst, New York, NY, p 38-63, 18 fig, 5 tab.

Descriptors: *Design, *Underground structures, *Design criteria, *Strength of materials, Design data, Operation and maintenance.

Design methods discussed in this chapter are based on more than sixty years satisfactory field experience with buried flexible structures. The new design approach explained considers overall needs of the drainage structure--environment, service demands, and strength requirements under dead and live loads. Computer analysis is practical and is an anticipated future development when sufficient research evaluates the influence of different soils and compactions on the structure. The following topics are treated in the chapter in the same sequence in which decisions are made in designing buried structures: (1) computation of loads; (2) culvert structural design; (3) earth backfill design; (4) foundation preparation; (5) minimum cover; (6) end treatment; and (7) maintenance. (See also W71-06639)
W71-06641

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 3 - SERVICE LIFE.
American Iron and Steel Inst., New York.
For primary bibliographic entry see Field 08F.
W71-06642

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 4 - HYDRAULICS.
For primary bibliographic entry see Field 08B.
W71-06643

HANDBOOK OF STEEL DRAINAGE CONSTRUCTION PRODUCTS: CHAPTER 15 - COST FACTOR.

Am Iron Steel Inst, New York, NY, p 142-150, 1967. 5 fig, 4 tab, 4 ref.

Descriptors: *Maintenance costs, *Cost analysis, Cost trends, *Cost comparisons, Costs, Economic prediction.

Cost per year of service depends on durability, maintenance, ease of replacement, and factors influenced by local conditions. Recent trends show an increase in pre-engineered and prefabricated structures with consequent reduction of on-the-job labor. This has the following three-way effect: (1) promotes factory-controlled quality under more ideal working conditions; (2) by reducing design and inspection time, it permits the engineer to concentrate on the whole job rather than its details; and (3) although product cost may be higher, installed cost is usually less. Subsections of this chapter discuss: (1) price vs. cost; (2) cost items included; (3) material cost; (4) hauling and handling; (5) excavation and backfill; (6) installation; (7) replacing the traffic surface; (8) detours, slow orders; (9) supervision, overhead contingencies insurance; (10) engineering costs; (11) unstable foundation conditions; and (12) the cost end of treatment. (See also W71-06639)
W71-06644

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 6 - COUPLINGS AND FITTINGS.
Am Iron Steel Inst, New York, NY, p 151-159, 1967. 16 fig.

Descriptors: *Steel pipes, Joints (Connections), Installation, Design data.
Identifiers: *Couplings.

Shop-fabricated corrugated steel pipe and pipe-arches are delivered in lengths convenient for shipping and handling. For longer installed lengths, standard connecting bands or special field joints are used. Joint selection criteria covered in this chapter include strength, joint tightness, simplicity, and economy of installation. Also treated are design features of couplings, standard and special fittings, fabrication details, and field installation of fittings. (See also W71-06639)
W71-06645

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 9 - SEWERS.

Am Iron Steel Inst, New York, NY, p 202-211, 1967. 9 fig, 4 ref.

Descriptors: *Sewers, *Design standards, *Treatment facilities, Sewerage, Steel, Equipment, Control systems, Control structures.
Identifiers: *Sewer design, Steel structures, Storm sewers, Combined sewers, Sanitary sewers.

This chapter defines terminology associated with sewers and sewerage and explains basics involved in the following areas: sewer system design, corrugated steel sewers, storm sewer inlets, standard and special fittings, manholes, sewers joints and outfalls, sewage treatment plants and lagoons, septic tanks, water control gates, and sewer maintenance and repair. Definitions include: sewer, sewage, storm sewer, sanitary sewer, combined sewer, industrial wastes, half-soling, threading, and tunneling. (See also W71-06639)
W71-06647

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 11 - AIRPORT DRAINAGE.

Am Iron Steel Inst, New York, NY, p 240-247, 1967. 4 fig, 2 tab, 4 ref.

Descriptors: *Surface runoff, *Drainage systems, *Controlled drainage, *Design standards, *Standards, *Drainage practices, *Rainfall-runoff relationships.
Identifiers: *Airport drainage.

The purpose of airport drainage is to remove water which may hinder any activity necessary for the safe and efficient operation of the airport. Artificial facilities are needed to collect surface runoff, dispose of excess groundwater, lower the water table, and protect slopes. Characteristics of airport drainage are summarized, and a list is presented of information needed prior to designing the drainage system. Requirements of airport drainage differ from those of culverts, storm drains, and subdrainage of highways, railways, industrial areas, agricultural, urban, and suburban areas; and these differences are reviewed, especially in regard to rainfall-runoff computations. Four types of drainage appearing on airports are mentioned, and Federal Aviation Agency recommended standards are listed. Remaining sections of the chapter concern the size of conduits, the selection structures, and storm drains. (See also W71-06639)
W71-06648

EARTHQUAKE RESPONSE OF ARCH DAMS,
Assam Engineering Coll., Gauhati (India); and Southampton Univ. (England).
U. C. Tahbilder, and H. Tottenham.
Proceedings American Society of Civil Engineers, Journal of the Structure Division, Vol 96, No ST11, p 2321-2336, Nov 1970. 16 p, 13 fig, 23 ref, 2 append.

Descriptors: Damping, Dams, Dam design, *Arch dams, *Dynamic response, Concrete dams, Deformation, *Earthquakes, *Finite element method, Stress analysis, Dynamic loads, Earthquake loads, Structural behavior, Computer applications, Stress, Analytical techniques, Acceleration (Physics), Seismic design, Displacements, Bibliographies, Foreign research.
Identifiers: Great Britain.

A theoretical assessment of dynamic response of arch dams caused by earthquakes is attempted using the finite element shell formulation. Results of the analysis reveal that seismic forces can induce high tensile stresses in arch dams, and should be given serious consideration in seismic-resistant design. The dam is idealized as an assemblage of rectangular elements with consistent mass distribution and viscous damping. The reservoir is taken into account by considering the added mass. Response to ground accelerations is evaluated by step-by-step integration of governing differential equations assuming a certain variation of dam acceleration within a short time interval. The method is stable and provides greater economy in computing time than the normal mode method. Response for a particular dam is obtained for 3 earthquakes: El Centro, May 18, 1940; Santa Barbara, June 30, 1941; and Taft, July 21, 1952. (USBR)
W71-06843

LOWESTOFT CHOOSES TUNNEL FOR SEWAGE OUTFALL.

Surveyor, Vol 84, No 4030, p 18, Aug 29, 1969. 2 fig.

Descriptors: *Outlets, *Sewerage, *Construction, *Currents (Water), *Cost, *Tunnel design, Discharge (Water), Sewage treatment, Tunnel construction, Tunneling machines, Waste disposal.

The sewage outfall project at Lowestoft is controversial in concept as well as in mode of construction. Problems of such outfalls include their frequent damage by heavy seas and their questionable ability to adequately disperse effluents. Sea currents at discharge points were investigated and found to be conducive to properly carrying effluent out to sea. The slightest beach pollution, however, will promote intense public distrust of the plan. Discharge shafts of the tunnel beneath the sea-bed will be raised through the use of massive hydraulic jacks, and unusual technique. Both the tunnel work and the shaft raising will be done employing compressed air. Dimensions of the tunnel and other construction techniques and problems are related. The scheme adopted is inexpensive with regard to capital and service costs. A complete sewage treatment works for the town would cost at least twice as much.
W71-06854

WATER SUPPLY AND WASTE DISPOSAL,
For primary bibliographic entry see Field 05G.
W71-06879

PIPING FOR WATER AND SEWER SYSTEMS,
For primary bibliographic entry see Field 05G.
W71-06883

COLLECTION AND TRANSPORTATION OF SEWAGE,
For primary bibliographic entry see Field 05G.
W71-06884

WATER WELL HANDBOOK,
Missouri Water Well and Pump Contractors Association, Rolla, Mo.
Keith E. Anderson.
St. Louis, Scholin Brothers Printing Corp, Second Edition, 1967. 281 p.

Descriptors: *Water wells, *Drilling, Rotary, Water quality, Casing, Well hydraulics, Drilling equipment.
Identifiers: *Cable tool drilling, Pumps, Flow measurement, Mathematical formuli and conversion tables, Electrical data.

Drillers, engineers, and geologists working with water wells have occasion to refer frequently to charts, tables and other data which are scattered throughout many books and catalogs. At present,

there has been no convenient reference source available which brings much of this information together. This booklet has been prepared for that purpose. An attempt has been made to bring together only the information most frequently referenced to by persons working with groundwater supplies. It is well indexed to assure usability. (Campbell-NWWA)
W71-06919

CABLE TOOL FISHING,
Water Well Journal Publishing Co., Urbana, Ill.
M. G. Decker.
Urbana, Water Well Journal Publishing Co, 1968. 70 p.

Descriptors: *Drilling, *Water wells, Drilling equipment, Oil industry, Groundwater.
Identifiers: *Cable-tool drilling, Fishing string, Sockets, Casing problems, Latch jacks, Whip stocks.

Drilling cables and sand lines should be watched carefully for signs of weakness or unusual wear; drilling tools should be inspected for fatigue cracks, particularly at welds; tool joints should be returned at regular periods; and no equipment or tools should be lowered into the well unless, as far as can be detected, they are in perfect condition. Fishing is the cause of annoying delays and financial loss in drilling operations. Therefore, it is essential to take every precaution with drilling tools, and to exercise care in drilling, in order to avoid as many fishing jobs as possible. However, in anticipation of the inevitable fishing job, it is a good plan to record the exact dimensions of everything used about, or in, the well so that information will be at hand for designing or selecting a suitable fishing tool. Any work being done in the drilling, cleaning out, or servicing of a gas, oil, or water well involves the risk of (1) failure of the drilling tools or the casing, or (2) erroneous procedure - either of which may result in a fishing job. Thus the hazards of fishing are frequently the cause of high drilling costs. (Campbell-NWWA)
W71-06921

GROUNDWATER PRODUCTION FROM THE BEDROCK OF SWEDEN,
Craelius Terratest AB, Stockholm (Sweden). Geological Dept.
Martin G. Beyer.
Proceedings of the International Symposium, Stockholm, October 1966, Published by Pergamon Press, Chapter 10, p 161-179, 1968.

Descriptors: *Drilling, *Water wells, Groundwater, *Sweden, Igneous rock, Metamorphic rock.
Identifiers: *Air drilling, *Cable tool drilling, Precambrian aquifers, Seismic profiles, Municipal water supply, Well locations.

The ever-increasing fresh water quantities needed for the supply of growing communities recreation areas and industries in Sweden has greatly increased the amount of water drawn from the mainly Precambrian bedrock. Drilling methods by compressed air now being introduced are many times more efficient than conventional cable tool drilling. Increased output and closer spacing of wells, however, demand closer over-all control of bedrock groundwater resources. (Campbell-NWWA)
W71-06923

WAVE ABSORBERS IN HARBORS,
National Engineering Science Co., Pasadena, Calif.
Bernard Le Mehaute.
Available from NTIS as AD-704 721, $3.00 in paper copy, $0.95 in microfiche. Waterways Experiment Station Contract Report CR 2-122, June 1965. 124 p. Contract DA-22-079-CIVENG-64-81.

Descriptors: *Waves, *Energy transfer, *Harbors, *Breakwaters, Absorption, Mathematical models, Beach erosion, Seiches.
Identifiers: *Wave absorbers.

It is the purpose of this report to analyze the effect of wave absorbers on harbor agitation. A critical analysis of the previous studies on wave absorbers is presented. Then an attempt is made to improve the state of the art in the design of wave absorbers and in particular of rubble mound wave absorbers. A study on scale effects of wave absorbers built in scale models for studying wave agitation in harbors is also presented. Aside of the literature survey and general considerations on wave absorbers, a number of new theories have been developed and presented within this report.
W71-06930

MODERN WATER WELL DRILLING TECHNIQUES IN USE IN THE UNITED KINGDOM,
Stow and Co., Ltd., Henley (England).
G. R. S. Stow.
Groundwater, Vol 1, No 3, p 3-12, July 1963.

Descriptors: *Water wells, *Drilling, *England, Rotary drilling, Well development, Screens, Acids.
Identifiers: *Cable tool drilling, Chilled shot core drilling, Mud flush rotary drilling, Reverse circulation rotary drilling, Vertical deflexion, Well restoration, Television inspection.

The paper describes the main water-well drilling systems used in the United Kingdom, with some details of the tools used and the principles of operation. Limitations as regards diameter and depth for various systems and their suitability for drilling different strata are discussed. The materials customarily employed for lining wells and for making sand screens are mentioned. The usual method of measuring the deflexion from the vertical is outlined. Methods of developing or improving the yields of wells, and inspections by television cameras are described. There is no universal economic drilling system. Particularly on repetition work it is important to use the system appropriate to the site conditions. The most interesting developments of late have been (1) reversed-circulation rotary drilling for soft unstable sediments and for hard rocks and (2) the use of air circulation instead of mud for drilling hard stable formations at relatively small diameters. Development of wells by acidizing and other means to improve the yield is worth more consideration. Many of the water-well drilling techniques are applicable to and have been used for bored piles and caissons. (Campbell-NWWA)
W71-06952

PROGRESS IN THE WATER WELL CONSTRUCTION INDUSTRY,
Western Well Drilling Co., San Jose, Calif.
S. T. Guardino.
Groundwater, Vol 2, No 1, p 31-34, January 1964.

Descriptors: *Water wells, *Drilling, Rotary drilling, Standards.
Identifiers: Water well design, *Water well industry, Test bore drilling.

The modern water well contractor is a combination structural engineer, mechanic, geologist and sanitarian. Contractor's skills and accumulated knowledge should be assembled within an area and used as the basis for design and water well specifications. Engineering a water well should have the primary objective of obtaining and adequate supply of potable water, with equal importance placed upon the protection of the source of supply. The drilling of a test bore should be included in the design of every water well. A properly drilled and accurately logged test bore can determine exact design features and equipment requirements. In an area where formation samples may be deceiving and where a more accurate log is required, it is possible to contract for an electric log of the test bore. When it is essential to obtain truly representative samples in an uncontaminated form, core samples may be taken as the test bore is being drilled. The water well driller should acquaint his customer with modern construction procedures and modern water well design just as he has become aware of building codes and architectural specifications in the construction of buildings and homes. Contractors must keep pace with the achievements of technical people associated with the water well industry by self-education and incentive. The water well industry should be, and is, proud of its responsibility. (Campbell-NWWA)
W71-06954

WELL DRILLING MANUAL.
Koehring Co., Enid, Okla. Speedstar Div.

Enid, Oklahoma, Koehring, 1966. 72 p.

Descriptors: *Drilling, *Water wells, Drilling equipment, Wells, Water supply, Groundwater, Estimated costs, Operations and maintenance.
Identifiers: Cable tool rigs, Rotary rigs, Reverse circulation drilling, Lost circulation, Fishing tools, Drill string, Rig maintenance, Bits.

This manual is a basic 'how-to-do-it' book in the sense that it goes through a step-by-step discussion of how each of the various types of water well drills operators: step-by-step procedures are discussed on how to drill a hole with each type of equipment in use. Basic fishing tools and fishing techniques for drilling tools 'lost' downhole are also explored. Because of varying geological conditions and varying needs, it is difficult to choose the best equipment to do the job. This manual can assist government and private users in the selection of the proper drilling machines. (Campbell-NWWA)
W71-06956

MANUAL OF WATER WELL CONSTRUCTION PRACTICES.
Oregon Drilling Association, Inc., Portland.

Portland, Spencer Etzel Enterprises, 1968. 85 p.

Descriptors: *Drilling, *Water wells, Rotary drilling, Hydrology, Oregon, Wells, Drilling equipment, Casings, Groundwater.
Identifiers: *Water well location, Geologic considerations, Safety, Cable tool construction techniques, Bailers, Grouting, Well disinfection, Well completions.

The first purpose of this Manual is to introduce young drillers to the natural resource with which they will be dealing, to the earth's crust in which water is found, to the machinery and tools drillers employ, to the practicable and permissible techniques of drilling and to the terminology of the trade. The second purpose of the Manual is to suggest sources where answers may be found to the questions likely to be encountered in Oregon's State Examination for a Drilling Machine Operator's license and a Drilling Contractor's license. It is an attempt to bridge the gulf between age and youth, age-old methods and techniques as new as tomorrow. It is well referenced and contains many useful tables and graphs. (Campbell-NWWA)
W71-06957

EFFECT OF RESEARCH ON PRESENT DRILLING COSTS,
American Association of Oil Well Drilling Contractors, Dallas, Tex.
J. W. Peret.
Fourth and Fifth Annual Rotary Drilling Conference, Houston, Texas; Transactions and Minutes of the AAODC Rotary Drilling Committee for 1966-67, p 39-52. 12 tab, 24 fig.

Descriptors: *Drilling, *Drilling research, Oil industry, Rotary drilling, Drilling equipment.
Identifiers: *Drilling costs (Oil), Footage trend, Rig trend, Rig penetration trend, Average footage costs.

The objective in this study is to present the various trends that have developed in drilling along with

measurement of the money involved. The basic factors used include the Footage Penetrated, Holes Drilled, and Rigs Used. The scope of the study covers the USA for a period of 10 years, through 1965. The trend of footage drilled has been downward, dropping from 233.9 million feet in 1956 to 181.4 million feet in 1965. The above figures, as reported to industry, include both Rotary and Cable Tool drilling. The net Rotary drilled footage for the same years is estimated to have ranged from 192.3 million feet 1955 down to 154.2 million feet 1965. This marked decline of 20% drop in domestic rotary drilled footage is one of the reasons accounting for the current oversupply of rigs available for hire. The trend of rigs has lowered from 2,683 in 1955 down to 1,384 for 1965. The trend of average footage penetrated annually per rig has improved. In 1955 the rigs on Rotating Status averaged 71,684 feet per year each while in 1965 this figure had risen to 111,424 feet per rig. This impressive rising trend of penetration capability was achieved through gains in technology. An incomplete list of these innovations includes improvements in Weight-Speed programs; Hydraulics; muds low in viscosity, density and solids; better design and metallurgy in drill strings, bits, pumps, and rotary connections; better practices in inspection, classification and grading of used drill strings and bits; along with many other advancements. (Campbell-NWWA)
W71-06958

PRESENT STATUS OF DRILLING RESEARCH,
American Association of Oil Well Drilling Contractors, Dallas, Tex.
Stanley Hutchison.
Fourth and Fifth Annual Rotary Drilling Conference, Houston, Texas; Transactions and Minutes of the AAODC Rotary Drilling Committee for 1966-67, p 34-38. 2 tab, 2 ref.

Descriptors: *Drilling, *Oil industry, Rotary drilling, Drilling fluids, Cementing.
Identifiers: *Drilling Research, Present field situation, Areas for drilling research, Incentives for drilling research, Data capture and retrieval, Rig automation, Drilling economics.

A survey of drilling research on a reconnaissance basis has recently been completed which had the major objectives of determining what was required to make progress in drilling, if there was an economically fruitful field for drilling research and development, and how this drilling research and development could best be accomplished. There was a consensus of opinion that is unlikely that new and exotic hole-forming methods and techniques will replace the rotary drilling method in the foreseeable future. Therefore, the greatest potential is in drilling as well as we already know how, and in making incremental improvements in rotary drilling methods. A number of ideas appear to offer economic research and development opportunities. It is doubtful the present level of drilling research and development will fulfill the oil industry's requirements. The operators who have continuous drilling programs have the major economic incentives for supporting an active drilling research program. Cooperative drilling research efforts are highly desirable in order to reduce the costs and spread the risk of an individual operator. (Campbell-NWWA)
W71-06960

THAI AIR BASE FLOOD CONTROL,
For primary bibliographic entry see Field 04A.
W71-06963

8B. Hydraulics

ANALYSIS OF EXPERIMENTS ON SECONDARY UNDULATIONS CAUSED BY SURGE WAVES IN TRAPEZOIDAL CHANNELS,
Societe Grenobloise d'Etude et d'Applications Hydrauliques (France).
F. Benet, and J. A. Cunge.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 1, p 11-33, 1971. 23 p, 5 fig, 1 tab, 10 ref, 4 append.

Descriptors: *Hydraulic jump, *Surges, *Waves (Water), *Unsteady flow, *Open channel flow, Open channels, Hydraulic models, Hydraulics, Turbulent flow.
Identifiers: *Open channel surges, Trapezoidal open channels.

Secondary undulations, referred to sometimes as Favre waves, are associated with surge waves in canals. In most practical cases, the amplitude of the undulations superimposed upon the surge is at a maximum near the banks. Both laboratory and field observations illustrate the two-dimensional nature of Favre waves. There is a considerable difference between the maximum water level fluctuations at the channel edges and at the center of the cross-section and, therefore, the water surface in a cross-section cannot be assumed to be horizontal. Two phenomena seem to be superimposed: Wave propagation in water of varying depth, with the wave amplitude depending on the energy which should have been dissipated by the jump; and a phenomenon depending on the initial velocity. (Knapp-USGS)
W71-06478

THE LENGTHS OF STATIONARY WAVES ON FLOWING WATER,
Cambridge Univ. (England). Engineering Lab.; and Bataafse Internationale Petroleum Maatschappij N.V., The Hague (Netherlands).
A. M. Binnie, and T. M. G. Cloughley.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 1, p 35-41, 1971. 7 p, 2 fig, 8 ref.

Descriptors: *Standing waves, *Uniform flow, *Open channel flow, Critical flow, Hydraulic jump, Hydraulics, Turbulent flow, Boundary layers, Velocity, Waves (Water).
Identifiers: Stationary waves.

A theoretical expression is obtained for the length of small-amplitude stationary waves on a stream in which the velocity is uniform in the upper part but diminishes linearly to zero at the bottom of the channel. The wave length is reduced by the lack of uniformity in the stream, an effect which had been noticed experimentally. (Knapp-USGS)
W71-06479

TURBULENCE CHARACTERISTICS IN FREE SURFACE FLOWS OVER SMOOTH AND ROUGH BOUNDARIES,
State Univ. of New York, Buffalo; and Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
Paul H. Blinco, and E. Partheniades.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 1, p 43-71, 1971. 29 p, 9 fig, 2 tab, 15 ref.

Descriptors: *Turbulence, *Open channel flow, *Boundary layers, *Turbulent boundary layers, *Roughness (Hydraulic), Turbulent flow, Erosion, Scour, Model studies, Hydraulic models, Reynolds number, Free surfaces.
Identifiers: Free surface flow.

The effects of boundary roughness and Reynolds number on the turbulence intensity in the direction of the flow were determined in an open channel flume. The results of this study suggest the possibility of using a universal equation relating turbulence intensities to boundary shear, kinematic viscosity and relative distance from the boundary. The relative turbulence intensity in the direction of flow with respect to the shear velocity seems to depend exclusively on the dimensionless distance from the boundary, which may be interpreted as a frictional Reynolds number. The relative intensity as a function of relative distance increases strongly with increasing bed roughness. (Knapp-USGS)
W71-06480

VELOCITY DISTRIBUTIONS IN WIDE, CURVED OPEN-CHANNEL FLOWS,
Imperial Coll. of Science and Technology, London (England). Dept. of Hydraulic Engineering; and Aleppo Univ. (Syria). Dept. of Engineering.
J. R. D. Francis, and A. F. Asfari.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 1, p 73-90, 1971. 18 p, 6 fig, 8 ref.

Descriptors: *Vortices, *Turbulent flow, *Open channel flow, *Meanders, *Hydraulic models, Eddies, Mixing, Hydraulics, Flumes, Boundary layers, Open channels, Velocity, Currents (Water).
Identifiers: Secondary flows.

Bends in rivers give rise to a spiral flow which gradually brings slow fluid originally near the bed to other positions in the cross-section. In an experimental investigation of secondary currents in sharp bends of relatively wide streams, measurements were taken of the tangential velocity at several cross-sections. The bends were of 180 deg deflection and were of rectangular section. The general equations of motion were solved using the method of finite differences. The calculation is based upon a simple model which ignores the complexities of slow spiral flows, and merely relies on the mixing that is induced by the non-uniform flow in the fluid entering the bend. (Knapp-USGS)
W71-06481

CONCEPT OF CRITICAL SHEAR STRESS IN LOOSE BOUNDARY OPEN CHANNELS,
West Virginia Inst. of Tech., Montgomery. Dept. of Civil Engineering.
A. S. Paintal.
Text in English and French. Journal of Hydraulic Research, Vol 9, No 1, p 91-113, 1971. 23 p, 9 fig, 2 tab, 12 ref, append.

Descriptors: *Reviews, *Hydraulic models, *Sediment transport, *Alluvial channels, *Bed load, Scour, Stream erosion, Shear stress, Erosion, Streamflow.
Identifiers: Critical shear stress (Scour).

The problem of defining critical flow condition associated with the initial instability of bed material particles was reviewed in relation to existing concepts. A distinct condition for the beginning of movement does not really exist, but for all practical purposes, a limiting bed shear stress for a bed material can be defined below the bed load transport is of no practical importance. A family of curves can be fitted into the data which show that the bed load transport rate varies as the 16th power of bed shear stress. This 16th power correlation is consistent with that concept of critical shear stress which stipulates that a small increase in bed shear stress causes a noticeable change in bed load transport. For the professional engineer, the concept of critical shear stress or limiting shear stress is very useful, since it indicates the flow under which a natural or an artificial bed will be stable. (Knapp-USGS)
W71-06482

DEVELOPMENT OF A MEANDERING THALWEG IN A STRAIGHT, ERODIBLE LABORATORY CHANNEL,
Geological Survey of Israel, Jerusalem.
Iaakov Karcz.
Journal of Geology, Vol 79, No 2, p 234-240, March 1971. 7 p, 6 fig, 21 ref.

Descriptors: *Channel morphology, *Scour, *Sedimentary structures, *Alluvial channels, *Hydraulic models, Model studies, Flumes, Dunes, Meanders, Braiding, Sediment transport, Bed load.
Identifiers: Flume models.

A preliminary, experimental study was made of the development of a meandering stream path in a straight erodible channel. Emphasis was on the visual rather than quantitative aspects of the bed deformation process. The following sequence of bed deformation leading to a development of a

meandering stream path was observed in shallow flows along a straight laboratory channel molded in pumice: (1) appearance of far-spaced bed undulations; (2) appearance of flow-aligned scours at the leeward ends of the undulation crests; (3) growth and spread of the scours and a gradual deformation of the surrounding stream bed into a thatched at offset pattern of scours with intervening mounds; (4) growth and merging of scours along interconnecting sinuous paths; (5) rapid excavation along a preferred tortuous path and appearance of a pronounced meandering thalweg. These events may be interpreted as results of the inherent structure of the parent flow. (Knapp-USGS)
W71-06485

BLOCKING EFFECTS IN FLOW OVER OBSTACLES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Mechanics.
Robert R. Long.
Tellus, Vol 22, No 5, p 471-480, 1970. 10 p, 11 fig, 11 ref. ESSA Grant No E22-15-69 (G).

Descriptors: *Stratified flow, *Unsteady flow, *Flow around objects, *Deflection, Diversion, Eddies, Backwater, Hydraulic jump, Bores, Surges, Non-uniform flow, Vortices, Turbulent flow, Hydraulics, Air circulation, Winds.
Identifiers: Blocking effect (Stratified flow).

A theoretical investigation is made of the flow of two fluids over an obstacle. Particular attention is given to the upstream disturbance that occurs when the obstacle is started up from rest in a long channel. This has importance as it relates to the blocking phenomenon that occurs when a stratified fluid like the atmosphere moves over barriers. The results of the analysis are borne out by the experiments in the special case of disturbances at a water-air interface. The blocking that occurs is accomplished by a bore moving up ahead of the obstacle raising the upstream depth. The phenomenon is unsteady; it is also non-linear as indicated by the fact that the upstream may be disturbed even when conditions permit no infinitesimal disturbance to progress upstream. (Knapp-USGS)
W71-06499

PHYSICAL PROCESSES OF SEDIMENTATION,
Reading Univ. (England). Sedimentology Research Lab.
For primary bibliographic entry see Field 02J.
W71-06503

SPECTRAL ANALYSIS - A PROTOTYPE STUDY,
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 07A.
W71-06511

RACE TO PLUG BURST MAIN BEFORE RAINS CAME.

Eng Contract Record, Vol 82, No 12, p 44-45, Dec 1969.

Descriptors: *Damages, *Remedies, *Repairing, Estimated costs.
Identifiers: *Storm sewers.

The article describes how a municipal storm sewer section, solidly plugged with a mixture of mud and water, ruptured and was repaired. Three steps were taken to correct the damage: (1) temporary lines were laid along the surface and the mains were pumped through these surface lines; (2) drop manholes were constructed at two sides of the threatened area; and, (3) three pumps were used to by-pass the plugged section of the line. The emergency measures for the public are related, and the theoretical causes for the break are included. The cost of repair for this unexplained occurrence is given.
W71-06543

ADDITIONAL INFORMATION-FAILURE OF STORM SEWER SYSTEM.
For primary bibliographic entry see Field 05G.
W71-06549

SEWERAGE.
British Standards Inst., London (England).

British Standard Code of Practice CP2005, 1968.

Descriptors: *Design, *Construction, *Sewers, Legislation.
Identifiers: Storm overflows, Tidal outlets, Trace effluents, Great Britain.

The Civil Engineering Code of Practice (No. 5, 1950), entitled DRAINAGE has been completely revised to incorporate new methods for the design and construction of sewers and auxiliary works. Recommendations are made regarding materials and components, basic data requirements, general design and construction of sewers, discharge of trade effluents, manholes, storm overflows, siphons, pumping stations and mains, and tidal outfalls. The relevant legislation is indicated, and methods for calculating rates of runoff are appended.
W71-06552

MODEL STUDIES OF STORM SEWER DROP SHAFTS,
Sigurd H. Anderson.
St Anthony Falls Hydraulic Laboratory, Minneapolis, Technical Paper No 35, Series B, p 1-61, Dec 1961.

Descriptors: *Hydraulic structures, *Laboratories, *Model studies.
Identifiers: *Drop shafts, *Storm sewers.

The Department of Public Works of the City of St. Paul, Minnesota, presently engaged in a program of enlarging their storm sewer system, is developing a drop-shaft design which will reduce the possibility of impact damage to the structure and also insure stable flow conditions in the underground interceptors. It was found that past designs required frequent inspection and maintenance at the base of the shaft to prevent failure of the structure. An experimental study led to the development of an impact-cup type of drop structure which could be effectively used to convey storm runoff waters from the surface to subterranean collecting systems with a minimum of air entrainment and a reduction in possible damage at the base of the drop. Pictures and measured sketches of the designs are included.
W71-06553

UNDERWATER INSPECTION--SEEING IS REVEALING,
For primary bibliographic entry see Field 05G.
W71-06555

SOME ASPECTS OF DEEP SEWER MAINTENANCE,
L. Goodhew.
Water Pollution Control, Vol 68, No 2, p 217-221, Mar 1969.

Descriptors: *Sewers, Weirs.
Identifiers: *Storm sewage, *Deep sewers.

The design and construction of deep sewers which are described are drawn from the Rochester, Chatham and Gillingham Joint Sewerage Board. It is advised to restrict the admission of storm sewage and to install storm overflow weirs only on the branch sewers. The maintenance of deep sewers as well as safety precautions, and cleaning and inspection methods are explained. For the first flush of storm sewage into the trunk sewer, a long and narrow chamber, with an overflow weir at the upstream end and an outlet into the trunk sewer from its downstream end, is constructed at a point where a branch sewer enters a trunk sewer.
W71-06558

STORM DRAINAGE PRACTICES OF THIRTY-TWO CITIES,
Richard A. Rogers, Kenneth R. Wright, and Elmer L. Claycomb.
J Hydraulics Div, Am Soc Civil Engrs, Vol 95, No 6, p 2195-2196, Nov 1969.

Descriptors: *Design criteria, *Storm drains, Rational formula.
Identifiers: *Urban Storm Drainage Criteria Manual.

Wright and Claycomb state that the Denver Regional Council of Governments (DRCOG) commissioned the preparation of an Urban Storm Drainage Criteria Manual in 1967. The related findings indicate that the Rational formula is often misused. They also mention that extensive research has been conducted on the subject of practical storm sewer design by the University of Missouri.
W71-06560

RATIONAL 'RATIONAL' METHOD OF STORM DRAINAGE DESIGN,
R. A. Rogers.
J Irrigation Drainage Div, Am Soc Civil Engrs, Vol 94, No IR4, p 465-480, 1968.

Descriptors: *Storm drains, *Drainage systems, *Design, *Rational formula, *Non-uniform flow, *Computer programs, Runoff Pipes.
Identifiers: *Submerged systems.

The method of a storm drainage system design is presented which utilizes the Rational Formula with a modification to allow for nonuniform runoff. The system is designed for critical periods when flow in a system or parts of a system is maximum as determined from a hydrograph of the runoff. This method is particularly suited for the design of submerged systems, and therefore, it was computerized. The results of a sample problem show larger pipe sizes than would be found when using the conventional method which adds times of flow in lines to concentration time at some arbitrary starting point.
W71-06561

OPTIMIZATION IN DESIGN OF HYDRAULIC NETWORK,
Bengal Engineering Coll., Howrah (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W71-06583

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS CHAPTER 4 - HYDRAULICS.

Am Iron Steel Inst, New York, NY, p 82-141, 1967. 47 fig, 18 tab, 22 ref.

Descriptors: *Hydraulic design, *Drainage structures, *Culverts, *Design data, *Runoff forecasting, Open channels, Sewers, Design flow.
Identifiers: *Sewer hydraulics.

This chapter explores the hydraulics of various drainage structures such as open channels, culverts, storm drains, and sanitary sewers, with the emphasis placed on culverts. Section I includes methods of hydrologic design and factors in drainage design. Section II involves the estimation of runoff from small areas and discusses the rational method, watershed characteristics, time of concentration, drainage area, and the Talbot and Burkli-Ziegler formulas. The hydraulics of open drainage channels such as ditches, gutters, and median swales is treated in the next section. Section IV discusses the hydraulics of sewers, including: design flow of sanitary sewers and of storm water; hydraulic considerations for sewers; transitions, bends, and junctions; pipe friction formula values of n -- the roughness coefficient in the Manning equation; determining storm sewer size and the hydraulics of subdrains. (See also W71-06639)
W71-06643

RANDOMLY FLUCTUATING FLOW IN A CHANNEL DUE TO RANDOMLY FLUCTUATING PRESSURE GRADIENTS,
National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center.
Morris Perlmutter.
Available from the National Technical Information Service as N71-18629, $3.00 in paper copy, $0.95 in microfiche. National Aeronautics and Space Administration Technical Note NASA TN D-6213, March 1971. 31 p, 7 fig, 13 ref.

Descriptors: *Open channel flow, *Steady flow, *Unsteady flow, Markov processes, Pressure, Frequency analysis, Hydraulic gradient, Fourier analysis, Stochastic processes, Statistical methods, Mathematical studies.
Identifiers: Fluctuating flow.

A randomly fluctuating pressure gradient of a stationary Gaussian Markovian form will cause a randomly fluctuating velocity to be superimposed on the steady incompressible flow in a channel. Correlations, spectra, and frequency response functions for the random functions are given. Random pressure signals were generated using Fourier series expansion with coefficients randomly picked from distributions whose parameters were obtained from the spectra of the pressure signal. The random velocity signals were then obtained from the pressure signal by use of the frequency response function calculated from the equation of motion. The increased power loss due to the fluctuations is given and the random pressure and velocity signals are compared for amplitude, frequency, and time lag. (Knapp-USGS)
W71-06665

RIVER-COAST INTERACTION: LABORATORY SIMULATION,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 02J.
W71-06697

ST. LOUIS FLOOD PROTECTION: INTERIOR DRAINAGE,
Herman M. McKinney.
J Hydraulics Div, Am Soc Civil Engrs, Vol 93, No HY4, p 129-147, July 1967.

Descriptors: *Drainage programs, Comparative costs, Storm runoff, Missouri, Water pollution control.
Identifiers: *St. Louis (Mo), Sewer hydraulics.

The interior drainage considerations in the project authorization and basis for determinations of storm runoff, hydraulic gradients, sewer capacities, gate closing stages, stormwater ponding capacities, seepage, base flow, required pumping capacities, and sewer sizes are presented. In addition, the basis for schemes of plans considered, and comparative cost analysis and selection of plans are evaluated.
W71-06750

ENTERPRISING PROJECT AIMS AT BRINGING SEWER DESIGN UP TO DATE,
Mike Sumner.
Water Pollution Control, Vol 107, No 1, p 25, Jan 1969.

Descriptors: *Hydraulic design, *Sewers, Water pollution control.
Identifiers: *Sewer junctions.

A joint research project on hydraulic criteria is being carried out by the Borough of Scarborough and the University of Toronto. The project specifically is concerned with finding the best design modification to eliminate flooding at sewer junctions.
W71-06755

SYSTEM DESIGN,
George E. Symons.
Water Wastes Eng, Vol 4, No 9, p M3-M21, Sep 1967.

Descriptors: *Sewerage, *Sewers, *Design, *Hydraulics, *Installation, *Storage tanks, Sewage treatment, Design flow, Storm runoff, Overflow, Water pollution control, Waste water treatment.
Identifiers: Combined sewers, Storm sewers.

This digest of information on sewerage systems includes definitions, explanations, and tabular data on a wide range of topics such as: sewer type classifications, considerations in sewer design, sanitary sewers, sewer hydraulics, storm and combined sewers, sewer appurtenances, and inplant piping systems. Conditions are enumerated under which sanitary sewers, combined sewers, or separate sewers should be installed. Storm sewers are recommended to relieve loads on existing combined sewers. Stormwater treatment is suggested unless an alternative can be employed such as sanitary wastes transport under pressure through small lines laid in existing combined sewers. The planning and design of storm and combined sewers is described including correct location and design capacity of such systems. Appurtenances relating to stormwater runoff, such as overflows and storm tanks, are defined and described. Storm tanks are more commonly used in combined systems in order that stormwater eventually be passed to sewage treatment works to avoid overflow of storm water into nearby bodies of water. Such tanks operate under gravity or pumping conditions. Tables, diagrams, and graphs in the digest include: sewer classification, sewer system layouts, population trends in the U.S., quantities of water and sewage flow in U.S. cities, amounts of hourly and daily sewage flow in a sample city, extreme flow rates as a function of population, filtration specifications, rates of flow using Bernoulli's, Manning's, and Hanzen-Williams' formulas, a sewer design slide rule, sewer hydraulic information, recommended minimum sewer grades, and design criteria for sewer appurtenances.
W71-06756

APPLIED FLOOD HYDROLOGY,
For primary bibliographic entry see Field 05G.
W71-06773

RUNOFF FROM COMBINED RURAL AND URBAN AREAS,
For primary bibliographic entry see Field 05G.
W71-06774

SOLUTION OF THE UNSTEADY ONE-DIMENSIONAL EQUATIONS OF NON-LINEAR SHALLOW WATER THEORY BY THE LAX-WENDROFF METHOD, WITH APPLICATIONS TO HYDRAULICS,
Royal Aircraft Establishment, Farnborough (England).
M. R. Abbott.
Available from NTIS as AD-706 649, $3.00 in paper copy, $0.95 in microfiche. Technical Report 69179, August 1969. 14 fig, 6 ref.

Descriptors: *Open channel flow.
Identifiers: *Shallow water, One-dimensional flow, Rivers, Equations of motion, Mathematical analysis, Great Britain, Lax-Wendroff method.

An adaptation of the two-step Lax-Wendroff method is used for solving the unsteady one-dimensional equations of non-linear shallow water theory, including both frictional resistance and lateral inflow terms. This finite difference method is fast, accurate and simple to programme and covers the formation and subsequent history of discontinuities in the solution, in the form of bores and hydraulic jumps, without any special procedures. The behaviour of the numerical solution behind these jumps is found in the examples to be sufficiently smooth without the addition of an artificial viscous force term. A variety of illustrative examples is given, including simple cases of flood waves in rivers, bores in channels resulting from rapid changes of upstream conditions, oscillatory waves on a super-critical stream and a simple hydrology example with a significant lateral inflow from rain. Several checks of the numerical method are included. The examples are confined to channels of uniform rectangular cross-section, but the method generalizes in a straightforward way to real rivers and estuaries in which the cross-section is non-rectangular and varies along the length of the channel.
W71-06778

EFFECT OF FREE STREAM TURBULENCE ON THE DRAG COEFFICIENT OF ANGULAR BLUNT BODIES,
Washington State Univ., Pullman.
J. A. Roberson.
Paper American Society of Civil Engineers, ASCE Hydraulic Division Special Conference, Univ Minn, Aug 1970. 32 p, 18 fig, 8 ref, append.

Descriptors: *Fluid mechanics, *Turbulence, Turbulent flow, Laboratory tests, *Drag, Turbulent boundary layers, Research and development, *Flow around objects, Wind tunnels, Pressure distribution, Flow patterns, Test procedures, Reynolds number, Effects, Flow separation, Hydraulics, Scale effect.
Identifiers: Drag-force, *Blunt bodies.

Tests made in a low-speed wind tunnel at Washington State University, Pullman, to study the effects of free stream turbulence on the coefficient of drag for angular bodies are described. Body shapes were tested for several conditions of free stream turbulence. Tests show that: (1) changes of the free stream turbulence intensity cause changes in the flow pattern and Reynolds stress within the flow about a body; (2) bodies having shapes such that reattachment of flow is not a factor experience an increase in the drag coefficient with increased turbulence intensity; (3) bodies for which reattachment or near reattachment of flow occurs with increased turbulence may experience an increase or decrease in drag coefficient with increased turbulence intensity, depending upon body shape, and pressure distribution on the sides of such bodies may change as much as 100% with a 10% change in turbulence intensity; and (4) free stream turbulence can cause unsteady dynamic forces on some body shapes. (USBR)
W71-06844

WATER SUPPLY AND WASTE DISPOSAL,
For primary bibliographic entry see Field 05G.
W71-06879

QUANTITY OF WATER FROM RAINFALL,
For primary bibliographic entry see Field 05G.
W71-06881

HYDRAULICS OF WATER AND SEWER CONDUITS,
For primary bibliographic entry see Field 05G.
W71-06882

GROUNDWATER AND WELLS.
University Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 04B.
W71-06920

PRINCIPLES AND PRACTICAL METHODS OF DEVELOPING WATER WELLS.
U.O.P., St. Paul, Minn. Johnson Div.

U.O.P. Johnson Division Bulletin No 1033, (Revised June 1968). 24 p, 23 fig.

Descriptors: *Water wells, *Groundwater, Wells, Hydraulics, Screens, Drawdown, Hydraulic gradient, Well capacity, Sands, Gravels.

Identifiers: *Well hydraulics, Over-pumping, Backwashing, Surge plungers, Compressed air, High velocity jetting, Well design, Bridging.

Water-well development and the importance of well screen selection have occupied the attention of many water well drillers for the past several decades. The well screen is the intake portion of the well structure for a well that obtains water from a water-bearing sand. The well screen allows water to enter the well freely, prevents sand from entering with the water, and serves as a structural support for the loose formation material. By experience over the years, drillers found that when the well screen openings are so small as to retain almost all the sand, the yield of the well is limited because adequate development of the formation cannot be done. They also found that too large openings permit the removal of too much of the formation resulting in settlement of overlying materials, or incomplete stabilization of the formation. Well screen openings of the right size permit development to the proper extent. This produces the desired results - good well efficiency and sand-free water. The development of wells by 'over-pumping' and 'backwashing' and with surge plungers, compressed air, and with high velocity jetting is also discussed in detail. (Campbell-NWWA)
W71-06944

TAKING REPRESENTATIVE FORMATION SAMPLES.
U.O.P., St. Paul, Minn. Johnson Div.

U.O.P. Johnson Division Bulletin No 638-S, (Revised December 1967). 2 p.

Descriptors: *Sampling, *Rotary drilling, Data collections, Drilling fluids.
Identifiers: Heaving, *Formation analysis, Drive-core sampling, Hydraulic drilling methods, Handling formation samples.

Much of the success of a completed water well depends upon the degree of care exercised in obtaining formation samples for analysis - a responsibility which lies directly with the driller. The right well screen for a given water-bearing formation can be recommended and provided by the screen manufacturer only when the samples are representative of the various strata in the formation. Correct labeling of samples, full and accurate information describing water levels, depths, methods of construction to be used and the amount of water wanted are also essential. Care and good judgment, plus observance of a few simple rules, are the critical items in obtaining formation samples for analysis. (Campbell-NWWA)
W71-06945

WELL POINT SYSTEMS.
U.O.P., St. Paul, Minn. Johnson Div.

U.O.P. Johnson Division Bulletin No 467D, (Revised March 1969). 9 p, 11 fig.

Descriptors: *Well points, *Dewatering, *Water wells, Water table, Groundwater, Well screens, Water supply, Screens.
Identifiers: *Well spacing, Screen length, Piping and connections, Typical irrigation systems, Dewatering systems, Depth of setting.

Well-point systems or suction-lift wells, can supply large quantities of water economically, where conditions are favorable. Three conditions are necessary. The water table must be within a few feet of the land surface to permit pumping from the wells by suction lift; a good stratum of water-bearing sand and gravel must be found at depths of 20 to 50 feet; and the wells themselves must be highly efficient. Well-point systems find extensive practical use in four fields: (1) to obtain water for irrigation; (2) to obtain water for muncipal or industrial purposes; (3) to temprarily dewater construction sites in wet ground; (4) to permanently lower the water table over an area for special reasons. The first two of these applications put the water to beneficial use. The third and fourth are drainage measures where the groundwater is carried away and wasted after being pumped from the wells. The operating principles and the installation details of well-point systems to supply water for irrigation or other uses are described. The fundamentals of dewatering are also discussed. (Campbell-NWWA)
W71-06948

TESTING WATER WELLS FOR DRAWDOWN AND YIELD.
U.O.P., St. Paul, Minn. Johnson Div.

U.O.P. Johnson Division Bulletin No 1243, (Revised April 1967). 8 p, 2 tab, 8 fig.

Descriptors: *Water wells, *Drawdown, Specific yield, Pumps, Static level.
Identifiers: *Pumping level, *Measuring water levels, Orifice meter, Weirs.

No matter what the size of a well or the quantity of water it will yield, if it is to be equipped with a permanent pump to operate at the highest efficiency, it should be accurately tested for drawdown and yield before the pump is purchased. Buying a pump without such a test is a good deal like buying a 'pig in a pole.' Many times high pumping costs and unsatisfactory pump performance have been erroneously charged to the well. In these cases an accurate test of the well in advance of the pump purchase would have more than paid for itself in the first cost of equipment and later on in operating costs. There are many ways to test a well for capacity, some of them good and some bad. If a well is important enough to be tested for capacity on completion, it is essential that it be tested accurately by the use of approved measuring devices and standard methods. Furthermore, to avoid confusion and misunderstandings, there must be agreement on and understanding of the terms commonly used in making capacity test of wells. It is the purpose of this bulletin to describe the most accurate and inexpensive methods of determing the actual yielding capacity of a finished well. Principal terms in use are discussed. (Campbell-NWWA)
W71-06949

HYDRAULIC FRACTURING,
G. C. Howard, and C. R. Fast.
New York, Society of Petroleum Engineers of AIME, 1970. 210 p.

Descriptors: *Hydraulics, *Oil industry, *Aquifer characteristics, *Injection wells, Cavitation, Flow characteristics, Hydraulic engineering, Hydraulic properties, Fluid mechanics, Acidizing, Cementing.
Identifiers: *Hydraulic fracturing, *Deep disposal wells, Fracture area, Fracturing fluids and additives, Propping agents.

Hydraulic fracturing is a method for increasing well productivity by fracturing the producing formation and thus increasing the well drainage area. This monograph is designed to be a thesis on hydraulic fracturing covering the state-of-the-art from the theory and technique of hydraulic fracturing to the application of nuclear energy as a means of cracking the reservoir rock and forming rubble. Hydraulic fracturing is based on the fact that injection pressure decreases when water, acid, cement or oil is pumped into a formation at high rate and at a high initial pressure. This work has considerable value in deep well liquid waste disposal applications and provides the practicing engineer with a source of information that will aid in judging the relative merits of various hydraulic fracturing treating procedures and the results to be expected from such methods. (Campbell-NWWA)
W71-06950

SOURCE WATER WELL DESIGN AND EFFICIENCY,
U.O.P., St. Paul, Minn. Johnson Div.
R. L. Schreurs.
Symposium on Treatment and Control of Injection Waters, Division of Production, American Petroleum Institute, Anaheim, California, November 1966. 18 p, 2 tab, 8 fig, 16 ref, 3 append.

Descriptors: *Water wells, *Drilling, *Oil industry, Specific capacity, Drawdown, Rotary drilling.
Identifiers: *Water well hydraulics, Damage ratio, *Water well design.

Many cheap source water wells actually can be expensive if they are inefficient and are produced for long periods of time. It is important to have efficient water wells so as to reduce the required number of wells and to minimize power costs. Several methods of determining the efficiency of wells as hydraulic structures are described. The damage ratio of a well is approximately related to the efficiency. Water well designers use an average inlet velocity of about 0.1 foot per second to minimize well losses, frequency of well development, and to prolong well life. Special terms are defined and case histories cited. Water well design and construction determine well efficiency. Important factors to be considered are the type of aquifer whether consolidated or unconsolidated, the length, the location and type of screening device, and the effectiveness of development. The petroleum industry and the water-well industry would benefit by a greater exchange of theoretical and practical information. (Campbell-NWWA)
W71-06951

RAIN-GAUGING PROGRAM TO PROVIDE GUIDE TO STORM SEWER DESIGN,
Harvey W. Duff, Russ L. Tobey, and George C. C. Hsieh.
Water Sewage Works, Vol 116, No 11, p 420-424, Nov 1969.

Descriptors: *Rain gages, *Data collections, *Storm drains, *Design criteria, *Electronic equipment, Computers.
Identifiers: *Rain data, *Storm sewers, *Seattle, Washington.

The Sewage and Drainage Section, Design Division of the Seattle, Washington, Engineering Department, is conducting a rain gaging program to provide sufficient precipitation data and storm data for urban-water studies for the purpose of determining a more realistic basis for the design of storm drain systems. Data for the program are obtained from electronic instruments and handled by a computer. It is estimated that only 0.2 percent of the possible data covering a four-year period is missing.
W71-06964

8C. Hydraulic Machinery

ORGANIZING AND PLANNING FOR SEWER MAINTENANCE,
Glen J. Hopkins, and Don Hurlbert.
J Water Pollution Control Fed, Vol 39, No 2, p 230-239, Feb 1967.

Descriptors: *Maintenance, *Repairing, Sewerage, Gate control, Missouri.
Identifiers: Storm sewer valves, Sewer separation, Kansas City (Mo).

The sewer maintenance program devised by the Maintenance Division of the Department of Pollution Control, Kansas City, Mo., is geared toward public service in the quick repair of damaged sewers, whatever the cause. This program also deals with sewer and catch basin cleaning, sewer malfunctions and connections, and preventive maintenance. The sewer system includes a number of gate and sluice gate valves on storm sewers that must be closed in times of flooding. In the case of overloaded sewers, if stormwater lines are found to be connected to sanitary sewers, the Maintenance Division requests that the two lines be disconnected.
W71-06559

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 7 - INSTALLATION INSTRUCTIONS.

Am Iron Steel Inst, New York, NY, p 160-183, 1967. 22 fig, 3 ref.

Descriptors: *Steel structures, *Installation.
Identifiers: *Corrugated steel, *Installation methods, Installation procedure.

Because of their strength, light weight, and resistance to fracture, corrugated steel structures can be installed rapidly, easily, and with the least expensive machinery. The first part of this chapter outlines the importance of good installation and the advantages of using corrugated steel in installation procedures. Other subsections discuss: preparation of the base, assembly of pipe culverts and sewers, vertical elongation of corrugated steel pipe, and backfilling. Entire sections are devoted to jacking, boring, lining, and bridge filling. (See also W71-06639)
W71-06646

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 9 - SEWERS.
For primary bibliographic entry see Field 08A.
W71-06647

OVERVOLTAGES AND INSULATION COORDINATION ANALYSIS AND APPLICATION FOR 735 KV,
Hydro-Quebec (Canada).
G. A. Baril, M. B. Guertin, and J. Parent.
Paper 33-09, CIGRE International Conference Large High Tension Electric Systems, Paris, France, Aug-Sep, 1970. 11 p, 4 fig, 3 tab, 8 ref.

Descriptors: *Extra high voltage, *Transmission lines, *Switching surges, Transmission (Electrical), Substations (Electrical), Test results, *Overvoltage, *Electrical insulation, Network analysis, Shunt reactors, Foreign research, Circuit breakers, Coordination, Ultra high voltage, Flashover, Electric coronas.
Identifiers: Canada, Manicouagan-Outardes (Can).

Results of switching overvoltage studies performed on a transient network analyzer for Manicouagan-Outardes and Churchill Falls 735-kv transmission systems are presented. Power-frequency overvoltages were considered during the studies. The results are analyzed to determine effects of various parameters on the switching surge overvoltages, and conclusions are applied to the insulation adopted for the lines. Based on international standards and recent technical achievements, the evolution of insulation coordination for the 735-kv system is examined. An identical procedure is applied to the evaluation of transmission line and substation insulation for 1000 kv and above. Reducing power-frequency overvoltages to a level lower than the maximum switching surge overvoltage will allow full use of surge diverters, thus ensuring adequate protection and acceptable insulation levels. (USBR)
W71-06835

UNDERGROUND POWER TRANSMISSION,
Ion Physics Corp, Burlington, Mass.
P. H. Rose.
Science Vol 170, No 3955, p 267-273, Oct 1970. 7 p, 7 fig, 1 tab, 24 ref.

Descriptors: Cryogenics, *Transmission (Electrical), Costs, Economics, Aesthetics, Electrical insulation, Electric power losses, Bibliographies, Public opinion, Superconductors, Alternating current, Direct current, Research and development, Converters (Electrical), Dielectrics, Transmission loss.
Identifiers: Gas-pressure cables.

Public opinion will override economic arguments for future underground transmission. Providing more electrical power and satisfying higher aesthetic standards will be expensive. Many technical problems must be solved for underground cables. Resistive losses causing cable temperature to rise, charging current of a-c cables resulting in critical lengths for power transmission, and insulation problems are only a few of the areas where much research is needed. Underground cables can be installed in trenches in some places, and in other cases service tunnels will be required under congested areas. Cryogenic cables cooled by hydrogen are being investigated; additional research is needed to assure safe installation in cities. Many questions of underground transmission are discussed and some data are given on research being conducted. (USBR)
W71-06836

IMPROVEMENT OF HYDRO-ELECTRIC SCHEMES BY HYDROMECHANICAL INVESTIGATIONS AND SCALE MODEL EXPERIMENTS,
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 06B.
W71-06845

RELAXATION OF INITIAL STRESSES IN BOLTED CONNECTIONS OF HYDRAULIC UNIT ROTORS DURING INTERMITTENT LOADS,
Bureau of Reclamation, Denver, Colo.
P. A. Pavlov, A. U. Gugov, and G. V. Isaev.
Available from NTIS as PB-193 627T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation Translation No. 701, Denver, Oct 1967. 11 p.

Descriptors: *Hydraulic turbines, *Impellers, *Hydraulic systems, Stators, Failure (Mechanics).
Identifiers: Bolted joints, Relaxation time, USSR, Translations.

With the increasing size and weight of modern high-power hydroturbine units, the bolted connections of the rotors to the shaft become one of the prime areas on which the reliability of the unit depends. Because of a failure of the bolted connection of a runner to a turbine shaft, the Leningrad Metalworks devised test procedures and equipment to investigate the relaxation of the initial stresses in bolted connections of hydraulic units. The equipment and procedures are described and graphs showing the results of the tests are given. Conclusions are: (1) Relaxation of initial stresses in the bolts is mainly due to residual stresses in the threads growing in proportion to the number of cycles of changes in live load. (2) Degree of relaxation is reduced in proportion to the increase in initial torque. (3) The basic cause of the failure investigated was insufficient torque of the bolts, which lead to intensive relaxation of the initial stresses corresponding to an increase in the additional stresses due to the action of external loads and finally to fatigue.
W71-06931

DESIGNING HYDRAULIC TURBINE PARTS FOR STRENGTH,
Bureau of Reclamation, Denver, Colo.
A. Ya. Aronson, A. U. Bugov, V. M. Malyshev, I. A. Skrylev, and G. Kh. Frank-Kamenetskii.
Available from NTIS as PB-193 619T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation Translation No 687, Denver, Colo, Aug 1967. 44 p. Translated from Izdat. 'Mashinostroenie,' Moscow-Leningrad, p 303-328, 1965.

Descriptors: *Hydraulic turbines, *Hydrodyamics, *Hydraulic systems, Structural behavior, Deformation, Stress.
Identifiers: Turbine parts, Structural shells, USSR, Translations.

Leningrad Metalworks engineers have developed a method of calculating stress conditions in metal spiral cases based on their experimental investigations and study of shell structures for different turbine components. The method uses the principle of superposition of stress conditions of the: (1) joint of spiral case with speed ring; (2) region somewhat removed from the speed ring, (3) joint between steel sheets of different thicknesses, (4) transition zone from free shell to concrete embedment, and (5) end of the ribbing. Meridional forces are calculated from the membrane theory of torus-shaped shells. For moment and horizontal forces where the spiral attaches to the speed ring, the latter can be considered as a rigid torus-shaped shell or, for welded spiral cases, an imaginary conical shell can be substituted and equations for deformation of conical shells used. For computing different types of ribbing depending on stress distribution, change of moment, and boundary stresses. Experiments show that stresses are distributed very unevenly in each section, the greatest being where the spiral is joined to the speed ring bands. Where the lower part is embedded in concrete, stress inequality appears only in the upper band. (Translator)
W71-06936

APPROXIMATE CALCULATION OF THE NATURAL FREQUENCIES OF VIBRATION OF RUNNERS OF FRANCIS HYDRAULIC TURBINES,
Bureau of Reclamation, Denver, Colo.
A. Ya. Aronson, M. M. Mishin, and D. S. Moskvin.
Available from NTIS as PB-193 631T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation Translation No 707, Jan 1967. 11 p, 1 tab, 4 ref.
Identifiers: *Francis turbines, Foreign design practices, Turbine parts, *Natural frequency, *Vibrations, *Hydraulic turbines, *Turbine runners, Turbine blades, Digital computers, *Mathematical analysis, Elasticity, Elastic deformation, Rigidity, Structural analysis, Structural behavior, Flexible foundations, Rings, Resonance, Rotation, Matrix algebra, USSR, Approximation method, Elastic foundations, Matrix methods, Structural, Leningrad Metworks, USSR.

Since the natural vibration frequencies of Francis hydraulic turbines must be determined during design, and the present method of calculation used at the Leningrad Metalworks in the USSR is long and cumbersome, approximate formulas were developed for calculating these frequencies, fully satisfactory for an evaluation of the several preliminary design variants of the runner. Calculating and test work in this field have established the fact that the runner band vibrates either as a ring or is displaced as a solid body during vibration of the runner system. Alternation of vibrational frequencies and modes is involved later in the actual design of the runner; so, at this stage, considering that the band vibrates as a ring and the mass of blades does not substantially affect the frequency, it is satisfactory to assume that when the number of blades is large, the action on the band can substitute for the action on any equivalent elastic foundation. Thus, the problem is reduced to an examination of vibrations of a ring on an elastic foundation. This is valid only for the several primary modes. Sample calculations are given, the results of which compare favorably with test values of frequencies.
W71-06937

THE EFFECT OF CAVITATION TYPE ON THE FORM OF HYDROTURBINE SEPARATION CHARACTERISTICS,
Bureau of Reclamation, Denver, Colo.
L. S. Shmuglyakov.
Available from NTIS as PB-193 626T, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation Translation No 699, July 1969. 10 p, 3 fig, 9 ref. Translated from: Energomashinostroenie No 1, p 25-27, 1963.
Identifiers: *Cavitation, *Hydraulic turbines, *Flow separation, Flow characteristics, Hydraulic machinery, Water, Physical properties, Laboratory tests, Flow patterns.

The form of hydroturbine separation characteristics, types of cavitation and the interrelations between the separation characteristics of cavitation types are analyzed. Methods of investigating cavitation based on the physical properties of the flow are compared, and critical states during cavitation are discussed. Restrictions imposed on laboratory studies of cavitation are noted. Applications of cavitation studies in monitoring the operation hydraulic machines at hydroelectric power plants are considered. It is concluded that all the procedures recently developed under laboratory and natural conditions are applicable in more exact analysis of cavitation operation conditions.
W71-06940

MECHANIZED SURFACE IRRIGATION SYSTEMS FOR ROLLING LANDS,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 03F.
W71-07050

8D. Soil Mechanics

GRAIN SIZE, MINERALOGY AND CHEMISTRY OF A QUICK-CLAY SAMPLE FROM THE ULLENSAKER SLIDE, NORWAY,
San Diego State Coll., Calif.; and Oslow Univ. (Norway). Inst. of Geology.
For primary bibliographic entry see Field 02J.
W71-06464

MOLE TUNNELING RESEARCH ADVOCATED.

Civil Eng, Vol 37, No 8, p 48-49, Aug 1967. 1 diag.

Descriptors: *Tunneling, *Tunnels, *Comparative costs.
Identifiers: *Mole.

Dr. Walter Hibbard, Jr., Bureau of the Mines Director, recently emphasized the need for more research and development on mechanized tunneling. There is a growing demand for tunnels for the following purposes: subways, utilities, transmission lines, mining, and urban freeways. Needs in each of these areas are discussed as are advances already made with the mole borer. Savings in the billion-dollar range are possible with advanced tunneling procedures. In addition to pefecting moles, guidance control, placement of lining, and methods for the transportation of muck out of the tunnel must be developed.
W71-06628

THE INFLUENCE OF THE SOIL-FORMATION PROCESS ON THE COMPOSITION AND PROPERTIES OF THE DEPOSITS OF THE SEASONALLY FREEZING AND SEASONALLY THAWING LAYERS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W71-06784

COMPUTING THE FORMATION OF ICE INTERLAYERS IN FREEZING MOIST SOIL,
Cold Regions Research and Engineering Lab., Hanover, N.H.
V. G. Melamed.
Available from NTIS as AD-711 874, $3.00 in paper copy, $0.95 in microfiche. Translation of Moscow Gosud Univ Merg Issledovaniyz VYP6, p 23-37, 1966. CRREL Translation, 1970. 11 p.

Descriptors: *Soil properties, *Soil physics, *Freezing, Moisture, Ice melting.
Identifiers: Interfaces, Integration, Phase studies, USSR, Translations.

An equation is derived which represents an essentially new condition of ice formation in the soils penetrated by frost, establishing the nature of the freezing, linking the dynamics of the temperature fields in both zones and the rate of the freezing front's advance with the dynamics of a moisture field.
W71-06787

PROBLEMS IN THE THEORY AND PRACTICE OF ARTIFICIAL FREEZING OF SOIL,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Kh. R. Khakimov.
Available from NTIS as AD-711 891, $3.00 in paper copy, $0.95 in microfiche. 178 p, 98 ref.

Descriptors: *Freezing, *Soil stabilization, *Soil properties, Underground structures, Soil stability, Ice, Heat transfer, Soilwater movement, Deformation.
Identifiers: Hygroscopicity, *Artifically frozen soils.

Physical processes occuring in the freezing of soils; Movement of water in the liquid phase in a freezing soil and deformations of the soil during a freezing around a pipe; Temperature regime of freezing; Consideration of the effect of filtration flow on the process of the closing of the ice and soil cylinders.
W71-06791

ANALYSIS OF SOIL MOVEMENT AROUND A DEEP EXCAVATION,
Woodward-Clyde-Sherard and Associates, Oakland, Calif.; and California Univ., Berkeley.
C-Y Chang, and J. M. Duncan.
Proc American Society of Civil Engineering Journal of Soil Mechanics and Foundation Division, Vol 96, No SM5, p 1655-1681, Sept 1970. 27 p, 20 fig, 2 tab, 25 ref, 2 append.

Descriptors: *Cut slopes, *Excavation, Failure (Mechanics), *Slope stability, Soil engineering, *Soil mechanics, Stress, Soil properties, Soil stability, Soil tests, *Movement, Deformation, Rebound, Strain, Bibliographies, Analysis, Behavior, Instrumentation, *Finite element method, Computer applications, Undisturbed soils.

Large soil movements in the 160-ft-deep excavation for the Buena Vista Pumping Plant in California prompted an investigation to determine if the movements were indicative of impending failure. The investigation consisted of: (1) conducting laboratory tests on undisturbed soil specimens to determine the strength and nonlinear properties of the soil; and (2) performing finite element analyses using the nonlinear soil properties to calculate soil movements and stresses at the end of excavation. Results of the analyses agreed well with the observed behavior of the excavation with regard to magnitude of soil movements and development of regions of local failure. Calculated stresses indicated that the soil movements were not indicative of impending failure. The case study shows that nonlinear finite element analyses, together with field instrumentation observations, form an effective means of investigating complex soil engineering problems. Has 25 references. (USBR)
W71-06837

OBSERVATIONAL DATA ON GROUND MOVEMENTS RELATED TO SLOPE INSTABILITY,
Shannon and Wilson, Seattle, Wash.
S. D. Wilson.
Proceedings American Society of Civil Engineers, Journal of the Soil Mechanics and Foundation Division, Vol 96, No SM5, p 1519-1544, Sept 1970. 26 p, 27 fig, 8 ref, append.

Descriptors: Deformation, Excavation, Failure (Mechanics), Field tests, Field data, Measuring instruments, Shear stress, *Slope stability, Stability, Soil mechanics, *Landslides, Displacements, Slopes, Movement, Earth movements, *Clays, Clay shales, Cuts, Fills, Slope stabilization, Failure surfaces.
Identifiers: *Progressive failures, *Terzaghi Lecture, Earth slides, Remedial treatment.

Data from field measurements that verify the progressive nature of landslides resulting from excavations at the toe of slopes in overconsolidated highly plastic clays and clay shales are presented. The data agree with generally accepted hypotheses concerning the mechanism of such progressive failures. Distribution of such movements changes with time, and total movements and velocities must be reviewed to understand the failure process. Horizontal movements resulting from construction of embankments on soft clays are progressive and similar to those resulting from cuts in overconsolidated clays. These movements often extend well beyond the toe of the embankment except when the fill is placed on a stiff layer overlying soft materials. Several progressive slides were stabilized by corrective treatment, including cylinder pile retaining walls, underground concrete buttresses, and slope flattening. Analysis of field observational data leads to a better understanding of the mechanism of failure and ultimately may lead to improved methods of stability analysis. (USBR)
W71-06838

ELASTIC ANALYSIS FOR BEHAVIOR OF ROCKFILL,
Bechtel Pacific Corp. Ltd., Melbourne (Australia).
N. O. Boughton.
Proc American Society of Civil Engineers, Journal of Soil Mechanics and Foundation Division, Vol 96, No SM5, p 1715-1733, Sept 1970. 19 p, 12 fig, 2 tab, 9 ref, 2 append.

Descriptors: Elastic theory, Computation, *Structural behavior, Dams, *Rockfill dams, Rock properties, Deformation, Rocks, Soil mechanics, Elasticity (Mechanical), Shear tests, Leakage, Strain, Stress, Seepage, Impervious membranes, Dam design, Settlement (Structural), *Dam facings, Computer applications, *Finite-element method, Triaxial tests.
Identifiers: Concrete slabs.

All concrete-faced rockfill dams higher than 300 ft have had serious leakage problems when first filled. In attempts to determine causes and to provide a rational basis for design, finite-element procedures are applied to rockfill dams with concrete faces. The application requires knowing the tangent elastic properties of rockfill at each state of stress in the analysis. The properties are determined from triaxial test results on several different rockfill materials, and stress-history dependent values for Young's Modulus and Poisson's Ratio are obtained. As a check on the validity of this procedure, the elastic analysis with stress-history dependent parameters is applied to confined compression and direct shear tests; consistent results are obtained in each case. Application of finite-element procedures using these elastic parameters to rockfill dams indicates that high tensions exist around the perimeter of the concrete face, and that the face has a considerable influence on the deformations of the underlying rockfill. (USBR)
W71-06840

A NEW TECHNIQUE FOR SOIL STRAIN MEASUREMENT,
E. T. Selig, and O. H. Grangaard, Jr.
Materials Research and Standards, Vol 10, No 11, p 19-21, 35, Nov 1970. 5 p, 12 fig, 6 ref.

Descriptors: Soil engineering, Soil mechanics, *Measuring instruments, *Soils, Soil tests, Strain, *Strain measurement, Embedded instruments, Field tests, Laboratory tests, Sensors, *Strain gages, Instrumentation, Calibrations, Dynamic response, Volume change, Measurement.
Identifiers: Static behavior.

A new instrumentation system has been developed for measuring static and dynamic strains in soil. The strain gage system is battery powered and portable for use in the field and laboratory. The

principle of operation involves the mutual inductance coupling between 2 coaxial soil sensors embedded within the soil. The coupling is extremely sensitive to the distance between sensors, and may be directly related to strain. Essential elements of the strain gage system are: (1) a pair of rugged disk-shaped sensors embedded in the soil in near parallel and coaxial orientation separated by a distance over which strain is to be averaged; and (2) a portable instrument package containing driving, amplification, balancing, calibration, and readout controls. The sensors are free-floating in the soil to provide minimal interference with the soil movements, a unique feature. Accuracy of readings is not affected by normal changes in soil composition or moisture content. Advantages, limitations, and examples of application of the system are presented. Studies show that the technique is simple, reliable, and versatile. (USBR)
W71-06841

A STUDY OF THE HARDNESS OF ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W71-06924

COMPUTER ORIENTED STABILITY ANALYSIS OF RESERVOIR SLOPES,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
R. K. Carter, C. W. Lovell, Jr., and M. E. Harr.
Available from National Technical Information Service as PB-198 432, $3.00 in paper copy, $0.95 in microfiche. Purdue University Water Resources Center, Technical Report No 17, January, 1971. 220 p, 14 fig, 5 tab, 19 ref, append. OWRR Project A-009-IND (1).

Descriptors: *Slope stabilization, Bank stabilization, *Slope stability, *Reservoir, Embankments, Landslides, Programming languages, Steady flow, Bearing strength.
Identifiers: Taylor solution, Bishop method, Modified bishop method, Critical sharing surface.

The purpose of the research was to develop a computer-assisted system of stability analysis for specific reservoir slopes. The versatility of the developed programs includes accommodations for variable ground surface and profile characteristics, both uniform and concentrated external boundary loadings, spatial variations in water pressure, and irregular as well as circular shaped failure surfaces. Several limiting equilibrium analyses by methods of slices have been reviewed. One of these, the Modified Bishop technique, previously considered applicable only to circular failure surfaces, was modified to include irregular shaped surfaces. The programs have been written in elementary Fortran IV language. There are currently five main programs and eleven integrated supporting routines. Conversion of the programs to small computer systems is considered highly practical. (Wiersma-Purdue)
W71-07058

8E. Rock Mechanics and Geology

NOMOGRAMS FOR CALCULATING THE DEPTHS OF PERENNIAL FREEZING OF ROCKS AND THERMAL CYCLES WITHIN THEM,
Cold Regions Research and Engineering Lab., Hanover, N.H.
V. A. Kudryavtsev, and V. G. Melamed.
Available from NTIS as AD-711 881, $3.00 in paper copy, $0.95 in microfiche. Trans of Merzlotnyge Isseldovaniyz, Vol 7, p 30-37, 1967. CRREL Translation, 1970. 7 p.

Descriptors: *Permafrost, *Thermal properties, Rock properties, Thermal conductivity, Freezing, Thawing, Melting, Numerical analysis.
Identifiers: *Nomographs, Phase studies, USSR, Translations.

In a collection of permafrost reports equations were proposed for calculating the depths of the perennial freezing and thawing of layers of rocks, and of the heat exchanges taking place in them. For a calculation of the heat exchanges Q (kcal) in the layer of rocks, pressing through the surface of the Earth during perennial freezing, formulas are given.
W71-06789

SOME INFLUENCES OF GEOLOGY AND MINING UPON THE THREE-DIMENSIONAL STRESS FIELD IN A METAMORPHIC ROCK MASS,
Geological Survey, Denver, Colo.; and Arizona Univ., Tucson.
T. C. Nichols, Jr., F. T. Lee, and J. F. Abel, Jr.
Engineering Geology (Bull AEG), Vol 6, No 2, p 131-143, Fall, 1969. 13 p, 7 fig, 8 ref.

Descriptors: Rock excavation, *Rock mechanics, Stress, Measuring instruments, *Stress distribution, Geology, Field tests, Strain, Mining, *Tunnels, Residual stress, Rocks, Three-dimensional, Displacements, Engineering geology, Stress concentration, Deformation, Rock pressures, Probes (Instruments), *Underground openings, In situ tests.
Identifiers: *Borehole deformation gage, Subsurface openings.

A solid inclusion borehole probe for determining 3-dimensional stress changes in rock has been developed by the Geological Survey in connection with an applied rock mechanics research project. Preliminary findings using the probe to determine the influence of excavation procedures, geologic conditions, and the pre-existing stress field upon the changing stress field in rock around an active opening are presented. Results show that major geologic structural features such as foliation, prominent joint sets, and faults have a major influence on redistribution of rock stress around an actively excavated opening, and excavation operations and original rock stresses can significantly influence stress redistribution in a manner that commonly cannot be explained by an elastic analysis. (USBR)
W71-06839

EARTHQUAKE RESPONSE OF ARCH DAMS,
Assam Engineering Coll., Gauhati (India); and Southampton Univ. (England).
For primary bibliographic entry see Field 08A.
W71-06843

HYDRAULIC JET DRILLING,
Esso Production Research Co., Houston, Texas.
William C. Maurer, and Joe K. Heilhecker.
Society of Petroleum Engineers, AIME, Preprint No SPE 24-34, p 213-224, 1969. 6 tab, 17 fig, 15 ref.

Descriptors: *Drilling, *Rock mechanics, Rock properties, Drilling equipment.
Identifiers: *Drilling research, Novel drilling techniques, Hydraulic jet drilling, Rock strength, Berea sandstone, Indiana limestone.

As a result of a detailed survey of over 25 novel drilling techniques, a laboratory study of hydraulic jet drilling was made. In initial tests, a cannon was used to fire 1.45-gal water pulses at rocks at pressures up to 25,000 psi. These tests showed that a threshold nozzle pressure must be exceeded before hydraulic jets will drill rock. Water jets having diameters of 0.2 to 1 in. drilled holes with diameters ranging from 0.8 to 4 in. in sandstone and limestone. These holes, which were 1 to 3 in. deep, were drilled in 0.02 to 0.2 seconds. These tests showed that water jets can effectively drill sedimentary rocks. Following these tests, a 2-in. diameter hydraulic jet drill was tested in a laboratory rig. A high pressure pump was used to pump water continuously through this drill at pressures up to 13,500 psi. This drill penetrated Carthage marble at 180 ft/hour, Indiana limestone at 280 ft/hour and Berea sandstone at 300 ft/hour. These tests showed that a full-scale hydraulic jet drill (3,000 hp) should drill 8 in. diameter holes in average-strength sedimentary rocks at rates of 200 to 300 ft/hour. These high drilling rates show that hydraulic jet drills have high potential for drilling oil wells economically. This paper is exceptionally well illustrated and well referenced. (Campbell-NWWA)
W71-06922

THE EFFECT OF HEAT ON SOME MECHANICAL PROPERTIES OF IGNEOUS ROCKS,
Gulf Research and Development Co., Pittsburgh, Pa.
A. B. Barbish, and G. H. Gardner.
Society of Petroleum Engineers Journal, December 1969, p 395-402. 2 tab, 13 fig, 5 ref.

Descriptors: *Rock properties, *Rock mechanics, *Drilling research, Aquifer characteristics, Gabbro, Pennylvania.
Identifiers: *Elastic moduli, Weibull parameters, Point penetration, Microcracks, Bending strength, French Creek (Pa).

The elastic moduli of most igneous rocks are greatly reduced by heating and depend, at room temperature, on the highest temperature to which they have been previously heated. This phenomenon was investigated by measuring velocity, attenuation, bending strength, and point penetration as functions of moisture content, porepressure, confining pressure, and highest previous temperature for a series of gabbro samples from French Creek, Pa. Bending strength and point pentration tests indicated that the microcracks introduced by heating to temperatures up to 1000 deg C have few cracks and are very uniformly distributed. Though the porosity was only about one percent, the attenuation of sound waves was found to be very dependent on moisture content. The attenuation was also found to increase greatly when the pore pressure and confining pressure were increased equally, even though the elastic moduli remained almost constant during the changes. The Weibull parameters were measured, but the uniformity of the material made exact determinations difficult. (Campbell-NWWA)
W71-06942

JACKS SAVE DAY FOR TEXAS TUNNELER.

Construct Methods Equip, Vol 51, No 9, p 90-93, Sep 1969. 7 fig.

Descriptors: *Tunneling, *Tunnel construction, *Tunneling machines.
Identifiers: *Pipe jacking, *Reaming auger, Houston, Texas.

To tunnel and line three oversized utility conduits under a Houston street, the subcontractor resorted to pipe-jacking instead of machine-tunneling when crews were unable to hold the boring rig on the center-line. The subcontractor planned to use a rig that was custom-built for a Dallas storm-drain project. With the addition of a shield over the auger, the job was attempted in Houston's soft earth. After the centering trouble stopped work, the remaining tunnels were completed by mining with pneumatic shovels and jacking the liners into place with the subcontractor's designed equipment.
W71-06973

8F. Concrete

WISCONSIN SANITARY SEWER WON BY 2.3%.
For primary bibliographic entry see Field 05G.
W71-06545

CHICAGO SEWER DRAIN PROJECT.
For primary bibliographic entry see Field 05G.
W71-06546

MICHIGAN SEWER AND ROAD JOB.
For primary bibliographic entry see Field 05G.
W71-06547

STORM SEWER CHANNEL IN NEBRASKA.
For primary bibliographic entry see Field 05G.
W71-06548

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION: CHAPTER 1 - PRODUCT DETAILS.
For primary bibliographic entry see Field 08A.
W71-06640

HANDBOOK OF STEEL DRAINAGE AND HIGHWAY CONSTRUCTION PRODUCTS: CHAPTER 3 - SERVICE LIFE.
American Iron and Steel Inst., New York.

Am Iron Steel Inst, New York, NY, p 64-81, 1967. 20 fig, 2 tab, 10 ref.

Descriptors: *Drainage systems, *Steel structures, *Economic feasibility, Inspection.
Identifiers: Soil conditions, Water conditions.

This chapter confirms that corrugated steel drainage structures can be economically designed for either normal conditions or for highly corrosive industrial and sanitary sewers and for mining, salt water and other difficult service conditions. The first section deals with inspection methods and results, including parts on: destructive forces; methods of determining durability; laboratory tests; highway culvert inspections; sewer inspections, air force base drainage inspection; airport drainage; and levee culverts and sewers. Section II concerns the influence of various types of soil and water conditions, and Section III discusses design for service life, including topics such as: the amount of durability needed; service conditions; base metals; galvanized coatings and their service life; non-metallic coatings and linings; pavements in pipe; California service life determination; and miscellaneous products and conditions (subdrainage, steel end sections, steel retaining walls, liner plates, sheeting, and guardrail). (See also W71-06639)
W71-06642

CRITERION OF CRACK RESISTANCE UNDER THERMAL STRESSES FOR A CONCRETE BLOCK RIGIDLY FASTENED IN THE FOUNDATION,
Bureau of Reclamation, Denver, Colo.
V. D. Dubyago.
Available from NTIS as PB-193 610T, $3.00 in paper copy, $0.95 in microfiche. Translated from the Russian, Izvestiic Vsesoiuznoga Nauchno-Isseledovatel-Skogo Institute Gidro Tekhniki, Leningrad, Vol 76, p 305-331, 1964. Bureau of Reclamation Translation No 672, Denver, June 1969. 38 p, 25 ref.

Descriptors: *Cracks, *Thermal stress, *Concrete testing, Concrete technology, Foundations.
Identifiers: *Concrete blocks, Crack control, Concrete aging.

A rationale is presented for selection of a criterion of crack resistance under thermal stresses. Methods of estimating crack resistance of a concrete block rigidly fastened in the foundation are considered, with account taken of its cooling regime, age of concrete at the moment of initial hardening, and the effect of the initial warming-up period.
W71-06796

8H. Rapid Excavation

SYMPOSIUM ON SEA-LEVEL CANAL BIOENVIRONMENTAL STUDIES.
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W71-06714

RADIONUCLIDE PRODUCTION FOR THE NUCLEAR EXCAVATION OF AN ISTHMIAN CANAL,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W71-06715

HYDROLOGIC REDISTRIBUTION OF RADIONUCLIDES AROUND A NUCLEAR-EXCAVATED SEA-LEVEL CANAL,
Isotopes, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 05B.
W71-06718

SEEPAGE CHARACTERISTICS OF EXPLOSIVELY PRODUCED CRATERS IN SOIL AND ROCK,
Army Engineer Nuclear Cratering Group, Livermore, Calif.; and Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 02G.
W71-06781

BUREAU OF RECLAMATION EXPERIENCE IN USE OF BORING MACHINES IN TUNNEL EXCAVATION,
Bureau of Reclamation, Denver, Colo.
B. P. Bellport.
Paper Fall Meet Society of Mining Engineers, St. Louis, Mo, Oct 1970. 61 p, 15 fig, 1 tab, 8 ref.

Descriptors: *Tunneling machines, *Tunnels, *Rapid excavation, Rocks, *Tunnel construction, Earth handling equipment, Rock excavation, Muck, Ventilation, Geology, Tunnel supports, Tunnel linings, History.

The experiences of the Bureau of Reclamation in the use of tunnel boring machines to excavate 6 major tunnels on water resources development projects are summarized. Case studies for each of the 6 tunnels, with data on tunnel dimensions, geological characteristics of the excavated rock, the tunneling machines used, machine operation, muck handling, method of tunnel support, ventilation system, and related information are presented. Despite the diversity of dimensions and the variety of rock encountered during excavation, the 6 tunnels have one major characteristic in common: excavation was significantly expedited by the use of boring machines. Boring machines make possible smoother walls and uniform diameter, and more importantly in the tunnel lining, considerably less concrete is required to maintain the specified uniform thickness than is required for the rough, irregular walls of a conventionally driven tunnel. One example cited was estimated to require 3-1/2 times more concrete for lining a conventionally excavated tunnel than was used for lining the bored tunnel. (USBR)
W71-06834

LASER ALIGNMENT TECHNIQUES IN TUNNELING,
A. Cooney.
Proceedings American Society of Civil Engineers, Journal of the Surveying and Mapping Division, Vol 96, No SU2, p 229-243, Sept 1970. 15 p, 10 fig, 2 tab, 1 ref, 2 append.

Descriptors: Tunnels, *Tunneling machines, Tunnel construction, Bench marks, Curves, *Alinement, *Lasers, Mining, *Surveying instruments, *Surveying, Construction, Tunneling, Deflection, Gradients, *Control systems, Construction control.
Identifiers: Targets.

With the introduction of the mechanical mining machine or 'mole', the role of the engineer has become one of providing a constant course or direction for the machine rather than establishing and projecting the tunneled path traversed by it. The primary tool in accomplishing this task is an alinement control system capable of providing guidance and detecting and distinguishing the components of motion generated by the mining machine. Consisting of a laser beam instrument, auxiliary control points along the tunnel, and a target system affixed to the machine, such a system provides a graphical guide to the machine operator. The mechanics of setting up such a system are outlined and various types of target systems are categorized. Techniques for adapting such a system to various alinement problems are proposed. (USBR)
W71-06842

ADVISORY CONFERENCE ON TUNNELLING HELD IN WASHINGTON, D. C. ON 22-26 JUNE 1970: PROCEEDINGS.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for Scientific Affairs.

Available from NTIS as PB-195 014, $3.00 in paper copy, $0.95 in microfiche. OECD Publ DAS/CSI/T/70.76, Aug 1970. 203 p.

Descriptors: *Tunneling, *Excavation, *Tunnel construction, Rock mechanics, Soil mechanics, Rock excavation, Underwater.
Identifiers: Urban areas, *Soft ground tunneling, *Rock tunneling, *Immersed tunnel construction.

Included in the proceedings are all addresses, statements and reports presented at the plenary sessions, together with the recommendations of the Conference. (Working Documents also available PB-193 286.) Proceedings cover reports on tunnelling demand, rock tunnelling, cut-and-Cover Construction, soft-ground tunnelling, immersed tunnel construction, research and development related to tunnelling, and Conference recommendations. The appendix contains prepared comments of certain national delegations and official observers, as well as other items of general interest.
W71-06926

BREAKTHROUGH ON SECOND MERSEY ROAD RUNNEL AS WORK COMMENCES ON DUPLICATE.

Civil Eng Public Works Rev, Vol 65, No 765, p 378, Apr 1970.

Descriptors: *Tunneling, *Tunneling machines, *Tunnel linings, *Linings, *Concretes, *Steel, *Epoxy resins, Construction equipment.
Identifiers: *Great Britain, *Mole, *Mini Mole.

A mole tunneling machine was used to excavate through sandstone rock between Liverpool and Birkenhead. The tunnel was lined with a segmented type of lining made up of reinforced concrete acting compositely with an inner steel skin. It was then covered with a high-build epoxy protective coating. A duplication of the tunnel is to be built for which a Mini Mole has been designed for driving a 2,202 yard pilot tunnel. A description of the Mini Mole is given.
W71-06972

PIPELAYER MINIMIZES TRENCHING AND BACKFILLING.

Construct Methods Equip, Vol 51, No 8, p 42-45, Aug 1969.

Descriptors: *Tunneling, *Tunnel construction, *Tunneling machines, *Installation, Pipelines.

Identifiers: *Badger Minor, *Tugmaster, *Galveston, Texas.

The first domestic water system for the Gulf Coast resort area near Galveston is being installed with two trenchless pipelaying methods known as the 'pull through' and the 'slow in' techniques. Basically, both involve tunneling through the ground and pulling long strings of pipe through the bore with very little disturbance of the ground at the surface. The principal pieces of equipment used on this job are the Badger Minor and the Tugmaster. The functions of these pieces are described and the two methods of pipe installation are explained.
W71-06974

SEWER MOLE TRIMS COST OF TUNNEL RIBS AND CONCRETE.

Construct Methods Equip, Vol 48, No 5, p 93-95, May 1966.

Descriptors: *Tunneling, *Tunneling machines, *Investigations, *Tunnel construction.
Identifiers: *Sewer tunnel, St. Louis, Missouri.

In a comparative study between the mechanical tunneling method and the drill-and-shoot method, five distinct advantages in mechanical boring were reported by Victor J. Scaravilli, a contractor on a St. Louis sewer tunnel. A description of the 23,000-foot sewer tunnel which the S and M Constructors of Cleveland are boring for the Metropolitan St. Louis Sewer District is included.
W71-06975

PAVED WAY FOR TRANSOONA'S LONG HOLE.

Eng Contract Record, Vol 82, No 10, p 58-60, Oct 1969. 1 diag.

Descriptors: *Sewers, *Tunnels, *Tunneling, *Tunnel design, Planning, Construction.
Identifiers: *Storm sewer, Canada.

BACM Industries Ltd. in Winnipeg built the largest and longest sewer tunnel ever contracted in Manitoba. This storm relief project is described in a brochure they mailed to all residents in the area. The basic construction plan involved the sinking of 10 shafts to a depth of 34 feet at regular intervals, the sewer being tunnelled outward from each shaft and connected to form one long tunnel. The soft-mining method was employed, and no problems were encountered except for the high water table created during spring because of flooding conditions above ground. This was overcome by boxing off the area and using sump pumps to divert the water until workers were finished in that area. Tunneling procedures used are discussed, including the open cut method employed for a portion of the storm relief sewer.
W71-06976

THOMPSON RIVER MOLE BORE IS THE LONGEST IN HARD ROCK.

Eng News-Record, Vol 183, No 5, p 18, Jul 31, 1969.

Descriptors: *Tunneling, *Tunneling machines, *Tunnel design, *Construction equipment, *Tunnels.
Identifiers: *Mole, *Australia.

A 12-mile tunnel, which will divert water from the Thompson River through 3,600-ft Mount Gregory to the Yarra River, is a 24 million dollar project. The project has three stages: (1) excavation of the Thompson and Yarra adits (totaling 3,260 feet); (2) excavation of the 1,390 foot Easton adit, and a 2.9 mile section of the main tunnel between the Easton and Thompson adits; and (3) boring of the 9.1 mile main tunnel using the mole.
W71-06977

MOLE BREAKS THROUGH AFTER 293-FT. DAY AND 1,114-FT WEEK.

Eng News-Record, Vol 183, No 4, p 28-29, Jul 24, 1969.

Descriptors: *Bids, *Tunnel construction, *Tunneling machines, Tunnel design, Cost comparisons.
Identifiers: *Mole.

The Utah Construction and Mining Co.'s mole boring machine, called Jarva Mark 11-1200, averaged 109 feet per day at an estimated $15/ft. cutter cost. Remarks made by the project manager which encompass the operation of the mole and the construction design, are included. A cost comparison of the different contract bids is given.
W71-06978

PIPES JACKED BEHIND MINI-MOLE.

Eng News-Record, Vol 182, No 20, p 45-46, May 15, 1969.

Descriptors: *Sewers, *Cost comparisons, *Tunneling machines, *Tunneling.
Identifiers: *Mini Mole, *Chicago, *Mole.

A mining machine, which jacks concrete pipe sections immediately behind it, is being used to build a sewer in suburban Chicago. The technique, commonly used to avoid cut-and-cover construction across highways and railroads, entails building a two mile sanitary sewer under a $2.9 million contract. The procedure involved is explained, and a cost comparison study of mining and jacking the 66-inch diameter pipe into place, with a 78-inch-ID reinforced concrete sewer using conventional methods of machine mining, ribs, lagging and monolithically placed concrete, is given.
W71-06979

MOLE BORES AT 16 FEET PER HOUR.

Eng News-Record, Vol 179, No 42, p 29, Oct 19, 1967.

Descriptors: *Drilling, *Drilling equipment, *Tunnel construction.
Identifiers: *Mole, West Germany.

A mechanical mole excavating under West Germany's Swabian Jura range has a cutting head made up of four rotating steel-toothed cutting wheels mounted on a rotating base. On the vertical axis, the operator of the mole steers by raising or lowering the cutting head; and horizontally, the mole is steered with the aid of small crawler tracks. A laser control system keeps the mole on course.
W71-06980

MODERN TUNNELING METHODS USED ON BOLTON SEWER.

Surveyor, Vol 85, No 4049, p 38, Jan 16, 1970. 1 fig.

Descriptors: *Tunneling, *Sewers, *Tunnel construction, *Tunnel design, *Tunneling machines.
Identifiers: *Great Britain.

Fifteen years ago, a Radcliff sewer connection by tunnel was more expensive than a riverside route on the surface. However, developments in tunneling made it possible for a tunnel route to provide savings over the sewer's probable life. So, a 3/4-mile long sewage tunnel was constructed. Blasting was used for the greater part of the length, and excavated materials were removed by means of an electrically-driven small gauge railway. Instead of employing compressed air for shaft sinking, a recently developed boring technique was used. The method is fully described along with other construction and installation procedures.
W71-06982

RECENT TUNNEL EXCAVATION WITH BORING MACHINES,
D. E. Cannon.
Civil Eng, Vol 37, No 8, p 45-48, Aug 1967. 3 tab.

Descriptors: *Tunneling machines, *Drilling, *Routing, *Rock excavation, *Tunneling.
Identifiers: *Mole, *Machine comparison.

Mole boring machines are making tunnel excavation records on the U.S. Bureau of Reclamation's San-Chama Project for additional water supply routes to Rocky Mountain cities of north central New Mexico. A series of three tunnels are required for this project. Geology reports indicated that the rock to be encountered--shale and sandstone--could be economically excavated by a mole. Drilling was performed from the surface along the tunnel alignments at roughly one mile intervals. A main concern was whether igneous dikes or sills existed at tunnel elevation which might preclude using a boring machine. Results of the exploration program were encouraging and did not indicate presence of igneous intrusions. Advantages cited of boring machines over concentional tunneling methods include: higher excavation rate, reduction in concrete needs, fewer personnel requirements, safer operations, reduction in required supports and in clean-up time. Disadvantages of mole boring include: high initial investment; long delivery period; restriction to softer rocks; and the requirement for a well maintained ventilation system, an accurate guidance system, and expert surveying technicians.
W71-06983

MECHANIZATION OF UNDERGROUND DRAINAGE WORK,
J. Dunglas.
Houille Blanch (HOBLAB), Vol 23, No 6, p 529-538, 1968.

Descriptors: Equipment, *Mole drainage, *Piping systems (Mechanical).
Identifiers: *Deep drainage.

The advantages of mechanized pipe-laying equipment for deep drainage systems are reviewed and technical features of trenching machines with optical depth-setting and built-in pipe laying systems are described. The adaptation of drainage system design to allow for use of mole-plow type machines is examined.
W71-06984

MOLE ANCHORS IN PILOT HOLE AND PULLS ITSELF AHEAD,
Michael Kolbenschlag.
Construct Methods Equip, Vol 52, No 4, p 87-88, 90-91, 94-95, Apr 1970. 5 fig.

Descriptors: *Tunneling machines, *Drilling, *Tunnels, *Drill holes.
Identifiers: *Mole, *Mole structure, Laser beam.

Instead of advancing by having the cutterhead jacked against the face, as most tunneling machines do, a Detroit hydraulic rig used a reverse technique. This mole drilled a pilot hole in the center of the face, locked in place an anchor concentric with the pilot-drill stem, and then pulled itself forward hydraulically against resistance of the anchor. The main cutterhead and pilot drill advanced simultaneously. Water and fault zones complicated early stages of work on the water tunnel, but the contractor hoped to make up time with the new method. Complete descriptions are given of the structure of the machine, mucking operations, laser guidance, and the mole's power source.
W71-06985

LASER BEAM ON MOLE SPEEDS SEWER WORK,
Alex Mair.
Eng Contract Record, Vol 83, No 2, p 44-45, Feb 1970.

Descriptors: *Instrumentation, *Tunneling machines, Tunneling, Operations.
Identifiers: *Mole, *Laser beam control.

A tunnel in Edmonton is being produced at an average of 120 ft/day. A tunnel mole and the use of a laser beam have hastened the procedure. The practical limit on the distance the beam can travel depends on two things: changes in direction of the line, and the amount of dust and fog in the air in the tunnel. The mole consists of a set of rotating arms with cutting teeth and a bucket wheel for catching the loosened material. The workings of the tunnel operation are given.
W71-06986

HYDRAULIC DESIGN OF UNLINED ROCK TUNNELS,
Skrikrishna V. Chitale, K. S. Rajagopalan, and David Ellis Wright.
J Hydraulics Div, Am Soc Civil Engrs, Vol 96, No HY4, p 1060-1065, Apr 1970. 1 fig, 3 ref.

Descriptors: *Rock properties, Hydraulic design, Roughness (Hydraulic).
Identifiers: *Unlined tunnels.

S.V. Chitale and K.S. Rajagopalan comment on Figures 2 and 3 of the original article. Fig. 2 shows a plot of resistance coefficients for unlined rock tunnels, and considerable scatter of data is apparent. The authors list reasons for this scatter. Fig. 3 gives tunnel overbreak for various tunnel sizes. The authors note the difficulty involved in using this figure to estimate overbreak depth because of the presence of considerable scatter, and they suggest a way to improve this situation. David Ellis Wright notes that progress will be made in designing unlined rock tunnels only if a critical comparison is made of results on prototype tunnels. He lists requirements to be satisfied in order that these results be of wider design use. He also defines terms such as tunnel size, overbreak, relative roughness, and equivalent sand grain diameter, which he uses in his commentary on the original paper. His comments include opinions on the resistance equation, the relation between resistance and roughness, partly-lined conduits, and data in Table 2 of the original paper.
W71-06987

8I. Fisheries Engineering

THE INFLUENCE OF ENGINEERING DESIGN AND OPERATION AND OTHER ENVIRONMENTAL FACTORS ON RESERVOIR FISHERY RESOURCES,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark.
Robert M. Jenkins.
Water Resources Bulletin, Vol 6, No 1, p 110-119, January-February 1970. 10 p, 1 fig, 5 tab, 4 ref.

Descriptors: *Reservoir fisheries, *Water quality, *Environmental effects, Structural engineering, Design, Hydrologic aspects, Water chemistry, Fish management, Ecology, Dissolved solids, Water temperature, Sampling, Methodology, Test procedures, Evaluation, Fish reproduction, Aquatic environment, Reservoir operation.

The effect of selected reservoir environmental variables--including surface area, mean depth, outlet depth, thermocline depth, water level fluctuation, storage ratio, shore development, total dissolved solids, growing season and age of reservoir--on fish standing crop in 140 large impoundments has been explored through partial correlation and multiple regression analyses. The sample was partitioned into 25 subsamples based on reservoir use type, water exchange rate, thermocline formation and water chemistry. Fish standing crops were estimated by summer rotenone sampling of coves or open water areas enclosed by blockoff net. Logarithmic partial correlation revealed highly significant (0.01 confidence level) positive effects of outlet depth, shore development and dissolved solids on total standing crop in the entire sample. At the 0.20 confidence level, the crop of all sport fishes is positively influenced by outlet depth, storage ratio and shore development and negatively by mean depth. A morphoedaphic expression, total dissolved solids divided by mean depth, provides a useful index to reservoir fish production. The relationship is curvilinear, with maximum crops expected at index values of 5 to 30. The index accounts for 62 percent of the variability in hydropower storage reservoir crops. (Woodard-USGS)
W71-06496

09. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

NATIONAL INSTITUTE OF ECOLOGY--AN OPERATIONAL PLAN.
Ecological Society of America.

December 1970. 42 p, 4 fig, 3 tab.

Descriptors: *Research facilities, *Project planning, *Organizations, *Institutions, Ecology, Social needs, Environment, Balance of nature, Biology, Financing, Planning, Federal budgets, Estimated costs, Programs, Professional societies, Technical societies, Facilities, Laboratories, Model studies, Analysis, Management, Research and development, Administration, Education, Social aspects, Political aspects.

The Ecological Society of America presents herein an organizational plan for a National Institute of Ecology. This proposed organization is designed to assemble multidisciplinary groups from existing ecological and scientific talents to work on major ecological and related questions. The Institute will perform five types of functions: (1) basic ecological research beyond the capacity of existing agencies; (2) conduct selected short-term projects in response to specific requests; (3) economic and social analysis focusing on environmental and resource management policy; (4) services to working ecologists, including analytical and modeling services, taxonomic support, and field facilities and installations; and (5) communication and education. The Institute will have a director appointed by a nine-member board of trustees elected for three-year overlapping terms. Trustees will be chosen by the Founding Institutions and an open Assembly representative of corporate groups and individuals. There will be a staff of forty persons which will increase to 150. Federal funding will be sought for the laboratory, equipment, and for BIOME modeling and synthesis. Federal and private funds will be sought for policy research, communication, and education. Costs of forecasting and planning will be met by contracting agencies. (Robinson-Florida)
W71-06619

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1969.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 02J.
W71-06720

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES RESEARCH ACTIVITIES AND INTERESTS AT THE UNIVERSITY OF CONNECTICUT,
Connecticut Univ., Storrs. Inst. of Water Resources.
William C. Kennard, and Jane S. Fisher.
Available from NTIS as PB-198 344, $3.00 in paper copy, $0.95 in microfiche. Connecticut University Institute of Water Resources Report No 12, September 1970. 55 p. OWRR Project A-999-CONN (7).

Descriptors: *Water resources research act, *Connecticut, *Universities, Manpower, Training Grants, Research and development.
Identifiers: *University of Connecticut.

Two principal functions of the University of Connecticut Water Resources Institute are to sponsor and coordinate research and to increase opportunities for the interdisciplinary approach both research and graduate training. This publication was prepared to show staff interests in the broad field of water resources. The information provided in this publication is based on responses to a questionnaire sent in February 1970 to all staff members of the University. The respondents represented 32 different departments or equivalent administrative units of the University. The information obtained was listed in the following categories: faculty conducting and/or interested in water resources research; faculty conducting water water resources research; faculty interested in but not currently conducting water resources research; summary of water resources research interests; summary of current water resources research; and summary of water resources research proposed or desired. (Knapp-USGS)
W71-06656

ABSTRACTS OF PUBLICATIONS REPORTING RESULTS OF RESEARCH,
North Dakota Water Resources Research Institute, Fargo; and North Dakota Univ., Grand Forks.
Gary W. Paulson.
Available from National Technical Information Service as PB-198 426, $3.00 in paper copy, $0.95 in microfiche. North Dakota Water Resources Research Institute Report WI-110-001-71FCS X-C, February 1971. 54 p. OWRR Project A-999 N Dak (1).

Descriptors: *Abstracts, *Water resources research act, *North Dakota, *Universities, Contracts, Grants, Bibliographies, Publications, Research and development, Water resources development, Groundwater, Surface water, Seepage, Water quality, Erosion, Water conservation, Lakes, Water pollution effects.
Identifiers: *North Dakota State University, *University of North Dakota.

Abstracts are presented of publications reporting results of research on water problems to indicate what research has been completed in North Dakota, the objectives of the research, and the results and application of the research. These abstracts are intended to provide a reference source to research reports available from the North Dakota Water Resources Research Institute. Complete reports of all research described in the publication can be obtained by making inquiry to Dr. Dale O. Anderson, Director, Water Resources Research Institute, North Dakota State University, Fargo, North Dakota 58102. The abstracts are organized alphabetically by problem areas. The problem areas are consistent with the water resources research categories established by the Federal Council for Science and Technology. (Knapp-USGS)
W71-07051

10. SCIENTIFIC AND TECHNICAL INFORMATION

PHREATOPHYTES - A BIBLIOGRAPHY.
Water Resources Scientific Information Center, Washington, D.C.
For primary bibliographic entry see Field 03B.
W71-06596

ANNOTATED BIBLIOGRAPHY ON SNOW AND ICE PROBLEMS,
Toronto Univ., Ontario, Canada. Dept. of Geography.
For primary bibliographic entry see Field 02C.
W71-06719

URBAN ECONOMICS AND PLANNING, VOLUME I, A DDC BIBLIOGRAPHY.
Defense Documentation Center, Alexandria, Va.
For primary bibliographic entry see Field 04C.
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ABSTRACTS OF PUBLICATIONS REPORTING RESULTS OF RESEARCH,
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For primary bibliographic entry see Field 09D.
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C. Others		
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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.

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SELECTED
WATER RESOURCES ABSTRACTS

'A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

VOLUME 4, NUMBER 14
JULY 15, 1971

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

NOMALOUS WATER, POROUS GLASS AND ILICIC ACID,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
V. A. Adams, M. K. Gabe, P. G. Manning, S. H. Whitlow, and J. D. Kingham.
ature Physical Science, Vol 230, No 2, p 39-40, Mar 8, 1971. 2 p, 1 fig, 1 tab, 12 ref.

escriptors: *Water chemistry, *Water properties, Gels, *Water structures, *Silica, Laboratory tests, est procedures, Investigations, Pollutants.
dentifiers: *Anomalous water, *Polywater, Porous ass, Silicic acid.

nomalous water formation in capillaries of 100 icrons suggests that a high surface to volume ratio necessary. The apparatus used incorporated orous Vycor glass and produced water with solid odies when the water was concentrated. The ycor is primarily composed of silica (96%). Oranic impurities in the Vycor were burned off by eating at 550 deg C in oxygen, and the assembled pparatus was evacuated overnight. A 1,000 watt uartz iodide lamp was used to irradiate the cell ecause it was felt that strong irradiation would nhance surface reactions; the temperature of the ycor glass was approximately 100 deg C during e experiments. Water diffusing through the ycor glass leaches out cations from the glass at e very high pressures within the micropores. The olume of condensate decreased by two-thirds hen desiccated for two days and the volume of the olid bodies which appeared was approximately 1% the volume of liquid collected. X-ray diffraction notographs and the absence of extinction in olarized light suggested that the solids were norphous. Observations suggest that anomalous ater is probably a silicic acid solution. (Woodard-SGS)
71-07263

1B. Aqueous Solutions and Suspensions

ON PAIRING IN 2:2 COMPLEX ION ELECROLYTES: (Co (NH3)5NO2)SO4,
onnecticut Univ., Storrs. Dept. of Chemistry.
. L. Masterton, and Thomas Bierly.
urnal of Physical Chemistry, Vol 74, No 1, p 139-3, Jan 8, 1970. 5 p, 2 tab, 18 ref. OWRR Project -013-CONN (5).

escriptors: *Ionization, *Electrolytes, *Conducity, *Aqueous solutions, Mathematical studies, quations, Cobalt, Sulfates, Ions, Evaluation.
entifiers: *Fuoss theory, *Ion pairing.

onductivity data are reported for aqueous solutions of (Co (NH3)5NO2)SO4 in the concentran range 0.0004 to 0.001. The Shedlovsky ethod was used to calculate an ion pair dissociaon constant of 0.0025. The pK value (2.60) is sigficantly larger than those of simple 2:2 sulfates, rresponding to greater association. This effect s been noted previously with salts of lower arge types. A comparison of observed pK values th those calculated using the Fuoss theory of ionir formation suggests that nonelectrostatic forces e of major importance in 2:1 and, particularly, in l coordination compounds. (Woodard-USGS)
71-07248

HYSICO-CHEMICAL PROPERTIES OF SOLS ND GELS OF Na-MONTMORILLONITE WITH ND WITHOUT ADSORBED HYDROUS ALUINUM OXIDE,
rdue Univ., Lafayette, Ind. Dept. of Agronomy.
r primary bibliographic entry see Field 02G.
71-07275

POLYWATER ON SILICA-FREE SUBSTRATES,
Commonwealth Scientific and Industrial Research Organization, Ryde (Australia). Div. of Food Preservation.
J. Middlehurst, and L. R. Fisher.
Nature, Vol 230, No 5296, p 575, Apr 30, 1971. 1 p, 1 fig, 14 ref.

Descriptors: *Water chemistry, *Chemical properties, *Water types, *Water properties, *Silica, Analytical techniques, Water structure, X-ray diffraction, Gels.
Identifiers: *Polywater, *Anomalous water.

Experiments using semiconductor grade, single crystal silicon, 'Irtran-2' (sintered polycrystalline zinc sulphide), silver chloride, and fused silica ('Infrasil') gave no detectable product. But after 3 days at 97% relative humidity, magnesium oxide single crystals (99.95% pure, artificially grown periclase (Spicer)) became covered with a surface layer of a translucent substance approximately 2 micrometers thick. The infrared spectrum of this material, both on the periclase surface and on a calcium fluoride surface, after transfer by scraping with a barium fluoride crystal, was similar to that of the polywater prepared by Lippincott, et al., together with a small proportion of normal water. (Woodard-USGS)
W71-07603

02. WATER CYCLE

2A. General

OPSET: PROGRAM FOR COMPUTERIZED SELECTION OF WATERSHED PARAMETER VALUES FOR THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
Earnest Y. Liou.
Available from the National Technical Information Service as PB-198 442, $3.00 in paper copy, $0.95 in microfiche. Water Resources Institute Research Report No 34, 1970. 299 p, 10 fig, 26 tab, 26 ref, 3 append. OWRR Project C-1282 (No 1964) (3).

Descriptors: *Computer models, *Hydrologic budget, *Streamflow, Flood control, Hydrographs, Infiltration, Parametric hydrology, Runoff, Surface runoff, Watersheds (Basins).
Identifiers: *Stanford Watershed Model.

The Stanford Watershed Model uses a hydrologic budget to model the land phase of the hydrologic cycle and thereby simulate streamflow on a continuous basis from climatological data and watershed parameters. Values for key parameters are estimated by trial-and-error. Subjective estimating differences have made it difficult to correlate parameter values with known physical characteristics of the watershed. This study sought to computerize a parameter optimization procedure based on the FORTRAN version of the Stanford Watershed Model known as the Kentucky Watershed Model. The resultant self-calibrating watershed model is named OPSET because it determines an optimum set of parameter values by matching synthesized flows with recorded flows. The first step in program development used sensitivity studies to determine which watershed parameter values are critical in simulating flow and are difficult to measure directly. The second step was to adjust estimates of the selected parameters in a way systematically improving flow simulation until the best possible matching is achieved. Independent adjustment schemes were used for parameters associated with runoff volumes, recession flows, and flood hydrographs. The third step was to empirically improve the model by applying it to a number of watersheds in Kentucky. OPSET estimates watershed parameters on a one water year basis, and values best describing watershed characteristics should be averaged from several OPSET-selected one-year-based values. See also W71-07062 andW71-07063) (James-Georgia Tech)
W71-07061

THE STANFORD WATERSHED MODEL: THE CORRELATION OF PARAMETER VALUES SELECTED BY A COMPUTERIZED PROCEDURE WITH MEASURABLE PHYSICAL CHARACTERISTICS OF THE WATERSHED,
Kentucky Water Resources Inst., Lexington.
Glendon A. Ross.
Available from the National Technical Information Service as PB-198 443, $3.00 in paper copy, $0.95 in microfiche. Water Resources Institute Research Report No 35, 1970. 178 p, 22 fig, 28 tab, 67 ref, 2 append. OWRR Project C-1282 (No 1964) (4).

Descriptors: *Streamflow, *Urbanization, *Watersheds (Basins), Computer models, Infiltration, Surface runoff, Watershed management.
Identifiers: *Stanford Watershed Model.

Streamflow simulation provides a powerful tool for developing better information on flow magnitudes and time patterns for the design of water resources projects. A self-calibrating simulation model was applied to about 20 Kentucky watersheds and successfully used to estimate appropriate values for model parameters. The procedure required to develop the necessary input data is explained in sufficient detail to essentially by a users' manual for the program. Physical descriptions of the watersheds are presented, and a number of key watershed characteristics (soil depth, permeability, cover, etc.) were measured. Relationships between model parameters (based on the Stanford Watershed Model) and watershed characteristics were explored. Those which are most promising in estimating parameter values for use in modeling streamflow from ungaged watersheds are presented. Parameter values were also estimated for a series of years spanning a period of intensive urbanization, and statistically significant trends were noted. The results provide framework for modeling changes in streamflow magnitudes and time patterns associated with urban development. (See also W71-07061 and W71-07063) (James-Georgia Tech)
W71-07062

AN EVALUATION OF RELATIONSHIPS BETWEEN STREAMFLOW PATTERNS AND WATERSHED CHARACTERISTICS THROUGH THE USE OF OPSET: A SELF CALIBRATING VERSION OF THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
L. Douglas James.
Available from the National Technical Information Service as PB-198 444, $3.00 in paper copy, $0.95 in microfiche. Water Resources Institute Research Report No 36, 1970. 117 p, 2 fig, 21 tab, 48 ref. OWRR Project C-1282 (No 1964) (5).

Descriptors: *Flood control, *Flood damage, *Streamflow, *Watersheds (Basins), Computer models, Land use, Non-structural alternatives, Runoff, Surface runoff, Urbanization, Watersheds (Basins).
Identifiers: *Stanford Watershed Model.

More informed selection among alternative flood control measures requires better information on marginal differences in flood hazard associated with marginal differences in tributary watershed characteristics. Hydrologic modeling is the most promising approach to answering this question; however, the use of existing models is hampered by the absence of information correlating model parameters with physical characteristics of the watershed. To deal with this situation, a method was developed for estimating the parameter values for the Stanford Watershed Model which best match recorded with simulated streamflows. Physical characteristics were measured for 17 rural watersheds. Correlations between the characteristics and the parameters were examined. Changes in parameter values with urbanization were also examined. The results were used to study variations in downstream flood peaks and in average annual flood damages associated with various tributary watershed characteristics. The end product is designed to help guide urban develop-

ment to minimize flood damage and storm drainage cost. (See also W71-07061 andW71-07062) (James-Georgia Tech)
W71-07063

AN APPROACH TO RESERVOIR TEMPERATURE ANALYSIS,
Corps of Engineers, Sacramento, Calif.
For primary bibliographic entry see Field 06A.
W71-07072

SUMMARY AND EVALUATION OF METHODS FOR DETECTING HYDROLOGIC CHANGES,
Agricultural Research Service, Athens, Ga. Southwest Watershed Research Center.
Willard M. Snyder.
Journal of Hydrology, Vol 12, No 4, p 311-338, Mar 1971. 28 p, 4 fig, 6 tab, 31 ref.

Descriptors: *Model studies, *Mathematical models, *Rainfall-runoff relationships, *Reviews, *Hydrologic equation, Systems analysis, Streamflow forecasting, Statistical methods, Linear programming, Regression analysis, Data processing, Runoff.
Identifiers: *Hydrologic change.

Methods for detection of hydrologic change were summarized on broad lines by classifying hydrologic data as statistical variates with definite statistical properties. The number of variates is controlled by available data, by the experimental design, and by the nature of the statistical test to be performed. The hydrologic variates may or may not be independent of each other, and they may or may not be serially independent in time. The number of variables in the test and their properties of independence control the analytical model used for testing a null hypothesis of change. The models treated in this paper are regression-discriminant models using time as a parametric expression of change. Of the models presented in this paper, only those intended for linear relationships of independent variates are considered well founded in both theory and practice. Many of the models are intended only for statistical discrimination between sets of hydrologic data. Models designed for detection of hydrologic change are probably not good representations of watershed systems. (Knapp-USGS)
W71-07271

STOCHASTIC SIMULATION OF MONTHLY STREAMFLOW BY A MULTIPLE REGRESSION MODEL UTILIZING PRECIPITATION DATA,
Nevada Univ., Reno. Desert Research Inst.
Jochanan Bonne.
Journal of Hydrology, Vol 12, No 4, p 285-310, Mar 1971. 26 p, 11 fig, 4 tab, 13 ref. OWRR Project A-026-NEV (3).

Descriptors: *Simulation analysis, *Rainfall-runoff relationships, *Stochastic processes, *Regression analysis, Systems analysis, Data collections, Data processing, Parametric hydrology, Mathematical models, Rainfall disposition, Computer programs, Markov processes.
Identifiers: *Stochastic models, *Operational hydrology.

A model for simulation of monthly streamflow series was developed by a multiple regression approach, which includes both precipitation and flow. The variables in the regression function represent the previous month's precipitation, antecedent month's precipitation, and the accumulated precipitation as independent variables, while the dependent variable is the current streamflow. A procedure is given for generating precipitation data. The frequency distribution of the flow record in each month is determined by statistical analysis. These monthly distributions are later imposed on the model in order to reproduce data with the same statistical parameters and distributions. Variables for the regression model are selected according to least variance, largest coefficient of determination, and the results of significance tests. Streamflows were simulated for 3 basins and results were compared with the historic record in terms of statistical parameters and frequency distribution. Results in general show good agreement with the historical data, mainly in terms of mean, standard deviation, and frequency distribution. Poorer agreement was found in the case of the less reliable parameters like skew coefficient and serial correlation. (Knapp-USGS)
W71-07334

MEAN ANNUAL RAINFALL/RUN-OFF RELATIONSHIP,
L. H. Young.
J Ind Water Engrs, Vol 24, No 7, p 423-430, Oct 1970. 1 fig, 3 tab.

Descriptors: *Rainfall-runoff relationships, *Cities, Analysis, Water loss.
Identifiers: *Urban hydrology.

World wide data are analyzed to investigate the relationship between the mean annual runoff, rainfall, and temperature of cities. Other parameters considered are found to have little independent effect. For non-arid climates the relationship is a straight line for which the slope is unity for 50 degrees F, steeper for lower temperatures, and flatter for higher temperatures. Water loss is found to be independent of rainfall only in the region of 50 degree F. A general runoff formula is developed for the overseas data, and a separate formula for the British Isles.
W71-07512

A DETAILED ANALYSIS OF CLIMATOLOGICAL AND HYDROLOGICAL RECORDS OF SOUTH FLORIDA WITH REFERENCE TO MAN'S INFLUENCE UPON ECOSYSTEM EVOLUTION,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
Thomas M. Terence.
Technical Report, 70-2, Oct 1970. 111 p, 34 fig, 12 tab, 33 ref. US National Park Service Contract DI-NPS-14-10-1-160-18.

Descriptors: *Ecosystems, *Climatology, *Hydrology, *Rainfall, *Water levels, *Water table, *Sea level, *Salinity, Florida.

Man's colonization of Southern Florida over the last 100 years and his influence upon the natural ecological environment has been well documented. Changes in the level of the fresh water table due to this influence, the rise in sea level due to deglaciation, and the changes in estuarine and near shore salinities are considered. Through modifications of the major natural resource, water, the rate of ecological change is 100 times as fast as if it had evolved naturally and the result has been that of ecosystem destruction. This study is of the fundamental parameters upon which other more detailed studies for environmental planning might be based. (Ensign-PAI)
W71-07672

FOREST INFLUENCE ON RIVER FLOWS,
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 04A.
W71-07689

2B. Precipitation

HURRICANE BEULAH. A REPORT IN RETROSPECT ON THE HURRICANE AND ITS EFFECT ON BIOLOGICAL PROCESSES IN THE RIO GRANDE VALLEY, TEXAS,
Department of Agriculture, Gainesville, Fla. Biology Research Lab.
N. E. Flitters.
International Journal of Biometeorology, Vol 14, No 3, p 219-226, 1970. 2 fig, 5 ref.

Descriptors: *Hurricanes, *Atmospheric pressure *Rainfall, *Animal behavior, *Metabolism Semiarid climates, Texas, Rio Grande, Environmental effects, Flood damage, Ecology, Climati data, Citrus fruits, Plant growth, Winds, Anima populations, Insects.
Identifiers: *Rio Grande Valley.

On 20 September, 1967, Hurricane Beulah, wit winds of 94.7-113 knots and a barometric pressur of 951.5 mb, struck Brownsville, Texas, movin northwestward over southern Texas. In the follow ing 4 days, torrential rains fell, totalling almost 7 cm in some areas. Over 8000 people were injure and more than 2 billion dollars worth of propert was destroyed. The author was at the Entomolog Research Center in Brownsville during the hu ricane and was able to observe the caged insects the center before and during the hurricane, an wild populations of animals and plants after th worst of the hurricane. The Laboratory insec were hyperactive during the hurricane and it is su gested that this phenomenon results solely fro metabolic changes induced by changes in a mospheric pressure. Insect populations normall increase greatly after such torrential rains and th was confirmed by such increases about 3 wee after Beulah. Probably the climatic changes resul ing from the storm were sufficient to trigg presumably arrested advanced developmen Among birds, robins, jackdaws, sparrows and dov suffered the greatest mortality. When the sun rea peared, many passing and rarely-seen species we observed in food searching activity. Many plan were shorn of their folliage, but in the warm sunn period following the hurricane they began ne growth, which conceivably resulted from th breaking of dormancy by the climatic change Citrus fruits were especially hard hit in the R Grande Valley, with trees destroyed and skin frui ruptured. (Casey-Arizona)
W71-07159

THE STRUCTURE OF THUNDERSTORM RAINFALL,
Illinois State Water Survey, Urbana.
John B. Stall, and Floyd A. Huff.
ASCE National Water Resources Meetin Phoenix, Arizona, Jan 11-15, 1971. Meetin Preprint 1330. American Society of Civil E gineers, Jan 1971. 30 p, 12 fig, 7 tab, 11 ref. Pric $0.50.

Descriptors: *Thunderstorms, *Storm structur *Rainfall disposition, *Cloudbursts, *Drainage e gineering, *Design storm, Storm runoff, Desig data, Design criteria, Weather patterns, Precipit tion, Central US, Illinois, Urbanization, Rai Hydrographs, Surface runoff, Storms, Rainfall-r noff relationships.
Identifiers: *Thunderstorm rainfall.

Procedures were developed that can be used better specify storm rainfall as an aid in producin better designs of urban storm drainage system Heavy storm rainfall in the Midwest occurs mo frequently from thunderstorm cells. The rain c reaching the ground has a diameter of 3 to 6 mile an area of 15 to 30 square miles, moves at velocity of 20 to 30 miles per hour, and has a dur tion of 30 to 60 minutes. Most of the rainfall occu during the first 10 minutes; it occurs in 2 to bursts, and 2 or 3 cells usually occur together. T resulting dynamic rainfall input onto an urb basin is a matrix in six dimensions of: depth, are duration, frequency, sequence, and place. In co sideration of the possible mean, inherent variabi ty, and skew of each of these six parameters t resulting matrix is almost impossible to evaluate. lustrations are given of five traditional, two-dime sional plots dealing with various pairs of these parameters or dimensions. Using point rainfall da for north-central Illinois, the Road Researc Hydrograph Method is used for an urban basin Chicago to show the effect of rainfall variability the resulting flood runoff hydrograph. For vario recurrence interval events, deviations from t mean rainfall depth of 6 to 15 percent are reflect directly in the resulting flood peaks. This exemp

ies an inherent variability which must be accom-nodated in all storm drainage design. (Poertner)
W71-07196

ATLANTIC HURRICANE SEASON OF 1970,
National Oceanic and Atmospheric Administra-ion, Miami, Fla. National Hurricane Center.
t. H. Simpson, and Joseph M. Pelissier.
Monthly Weather Review, Vol 99, No 4, p 269-77, Apr 1971. 9 p, 4 fig, 1 tab, 6 ref.

Descriptors: *Hurricanes, *Atlantic Ocean, *U-ited States, *Storms, Reviews, Gulf of Mexico, Winds, Wind velocity, Precipitation (Atmospher-c), Hydrologic data, Meteorological data, Tropical egions.
Identifiers: *Hurricanes (1970), *Tropical storms, torm damage.

A general overview of the 1970 hurricane season in he North Atlantic is presented together with etailed accounts of all named tropical cyclones nd certain subtropical or hybrid storms. Of the even named Atlantic storms of 1970, only three eached hurricane intensity; and only Celia brought urricane-force winds to the United States. These gures compare with a total of 180 tropical storms nd hurricanes over the past two decades for a early average of nine. Of these, an average of hree per year crossed the U.S. coastline, and three very 2 years brought hurricane winds to the main-nd. Nevertheless, 1970 will be remembered as the ear of Celia, the most destructive storm ever to each the Texas coast. (Woodard-USGS)
W71-07265

AN APPARENT RELATIONSHIP BETWEEN THE SEA-SURFACE TEMPERATURE OF THE TROPICAL ATLANTIC AND THE DEVELOP-MENT OF AFRICAN DISTURBANCES INTO TROPICAL STORMS,
National Oceanic and Atmospheric Administra-on, Miami, Fla. National Hurricane Center.
Toby N. Carlson.
Monthly Weather Review, Vol 99, No 4, p 309-10, Apr 1971. 2 p, 1 fig, 1 tab, 4 ref.

Descriptors: *Storm structure, *Water tempera-ure, *Atlantic Ocean, *Tropical regions, Weather forecasting, Storms, Regression analysis, Hydrologic data, Meteorological data, Isotherms, Hurricanes, Surface waters.
Identifiers: *African coast.

An analysis of sea-surface temperatures over the ropical Atlantic for the past 5 yr shows a correla-on between the number of tropical storms formed etween July 10 and September 20 and the ocean emperatures over a wide area centered near 10 eg N and 35 deg W. If the sea-temperature nomaly in the tropical Atlantic proves to be per-stent for periods of several months, it may ecome useful as a predictor of hurricane activity or that season. (Woodard-USGS)
W71-07266

SNOWFALL PREDICTION METHOD FOR HE ATLANTIC SEABOARD,
llied Research Associates, Inc., Concord, Mass.; nd Center for the Environment and Man, Inc., artford, Conn.
avid B. Spiegler, and George E. Fisher.
Monthly Weather Review, Vol 99, No 4, p 311-25, Apr 1971. 15 p, 28 fig, 2 tab, 15 ref.

Descriptors: *Snowfall, *Melt water, *Weather orecasting, *Atlantic coastal plain, Model studies, eviews, Hydrologic data, Meteorological data, limatic data, Methodology.
Identifiers: *Atlantic seaboard, *Snowfall predic-on.

Melted precipitation and snowfall data from eight inters were used to develop a snow and melted recipitation prediction model associated with 50-mb cyclones along the Atlantic Seaboard. The major potential for heavy snow exists in a band extending from 75 to 225 miles to the left and from 250 to about 1,000 miles ahead of the 850-mb cyclone in the 12-hr period beginning 6 hr after routine upper air observation time. Application of the prediction model of snow amounts to some storms from the 1968-1969 winter season indicate they provide valuable guidance to the forecaster during periods of East Coast storms. (Woodard-USGS)
W71-07267

ATLANTIC TROPICAL SYSTEMS OF 1970,
National Oceanic and Atmospheric Administration, Miami, Fla. National Hurricane Center.
Neil L. Frank.
Monthly Weather Review, Vol 99, No 4, p 281-285, Apr 1971. 5 p, 3 fig, 4 tab, 6 ref.

Descriptors: *Storms, *Hurricanes, *Tropical regions, *Storm structure, Reviews, Atlantic Ocean, Gulf of Mexico, United States, Meteorological data, Data collections.
Identifiers: *Tropical storms, *Storm origins, *Storms (1970).

The history of all tropical systems that formed over the Atlantic, Caribbean, and Gulf of Mexico during the 1970 hurricane season is documented. There were a total of 87 systems from which 26 depressions and seven named storms evolved. Systems that originated on the Atlantic side of Central America played a very prominent part in producing a bumper crop of east Pacific storms and hurricanes where 18 storms formed. Eleven of these were initiated by systems of African origin. Two were spawned by waves that formed over the Caribbean, and five storms emerged from the ITCZ in the Pacific. (Woodard-USGS)
W71-07268

CALCULATION OF MEAN AREAL DEPTH OF PRECIPITATION,
Tennessee Univ., Knoxville. Dept. of Engineering Mechanics.
J. E. Akin.
Journal of Hydrology, Vol 12, No 4, p 363-376, Mar 1971. 14 p, 9 fig, 2 tab, 3 ref, 2 append.

Descriptors: *Depth-area-duration analysis, *Computer programs, Runoff forecasting, Rainfall-runoff relationships, Networks, Rain gages, Precipitation (Atmospheric), Data processing.
Identifiers: *Precipitation data analysis.

A new procedure for the calculation of the mean areal depth of precipitation is presented and compared with the commonly used methods. The procedure is conceptually simple and easily programmed for computer application. This procedure assumes a linear distribution of precipitation between stations. Thus its accuracy is directly dependent on the accuracy of this assumption. There are many cases where the true distribution of precipitation is not linear. A coarse linear distribution probably would not adequately model the true distribution. In such cases, one should obtain better accuracy by using the nonlinear distribution model also presented. (Knapp-USGS)
W71-07270

STORM INTENSITIES VERSUS SEASONAL RAINFALLS,
Melbourne Univ. (Australia). Dept. of Agricultural Engineering.
A. K. Turner.
Journal of Hydrology, Vol 12, No 4, p 377-386, Mar 1971. 10 p, 3 fig, 6 tab, 11 ref.

Descriptors: *Rainfall intensity, *Rainfall disposition, *Distribution patterns, Rain gages, Networks, Meteorology, Frequency analysis, Duration curves, Probability, Storm runoff, Statistical methods.
Identifiers: *Storm intensity.

To test the hypothesis 'if the seasonal distribution of rainfall is similar at two stations, there is probably a consistent relationship between intensity and duration of rainfalls for a given average frequency', data from three separated localities were examined. The results indicate close relationships between yearly, seasonal, monthly and the longer storm events, but discrepancies occur for the shorter time intervals. It is suggested that these discrepancies are due to thunderstorms and should be considered separately from the rest of the data. (Knapp-USGS)
W71-07272

WATER RESOURCE OBSERVATORY WIND DATA, WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W71-07306

2C. Snow, Ice, and Frost

FINAL REPORT ON RESEARCH AND ENGINEERING DEVELOPMENT AND EVALUATION OF ICE NUCLEI DISPERSION SYSTEMS, MAY 1, 1967 TO MAY 1, 1970.
Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 03B.
W71-07243

A SNOWFALL PREDICTION METHOD FOR THE ATLANTIC SEABOARD,
Allied Research Associates, Inc., Concord, Mass.; and Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 02B.
W71-07267

A BIBLIOGRAPHY OF ARCTIC WATER RESOURCES,
Alaska Univ., College. Inst. of Water Resources.
Charles W. Hartman, and Robert F. Carlson.
Available from the National Technical Information Service as PB-198 668, $3.00 in paper copy, $0.95 in microfiche. Alaska Institute of Water Resources, Report No IWR-11, Nov 1970. 552 p. OWRR Project A-031-ALAS (1).

Descriptors: *Alaska, *Arctic, *Cold regions, *Bibliographies, Polar regions, Subarctic, Permafrost, Glaciology, Snow.

This bibliography of 2978 references consists of two parts - a keywords listing and citation section. The entries were selected for inclusion on the basis of their relevance to the understanding the nature of the land-based water cycle in Alaska's Arctic and Sub-Arctic regions. All available references to Alaskan areas with the exception of the southeast region were included. With few exceptions material has been excluded which was primarily concerned with the mechanical aspects of permafrost and oceanographic data. References concerning glaciology, water supply, and waste disposal were not specifically searched, but were included when available.
W71-07333

MEASUREMENT OF DISCHARGE UNDER ICE COVER,
Department of Energy, Mines and Resources, Ottowa (Ontario). Inland Waters Branch.
P. W. Strilaeff, and J. H. Wedel.
Canada Dept. of Energy, Mines, and Resources, Inland Waters Branch Technical Bulletin No 29, 1970. 14 p, 13 fig, 1 tab.

Descriptors: *Discharge measurement, *Streamflow, *Ice, *Ice-water interfaces, Methodology, Stream gages, Instrumentation, Current meters, Water levels, Surface waters, Hydrologic data, Evaluation.

Identifiers: *Ice covered streams, *Northern Canada.

Many difficulties are encountered in the measurement of discharge under ice cover, particularly in the operation of hydrologic data-gathering networks located in Arctic and Sub-Arctic regions. Difficulties result from extreme ice thicknesses, double thicknesses of ice, large depths of slush ice, coincidence of spring flows with ice breakup, freeze-up of gaging equipment in sub-zero temperatures, etc. Some of these difficulties are discussed, and procedures used in the operation of networks in northern areas of Canada are outlined. A possible technique for the estimation of river discharge using a single velocity in a cross-section is briefly described, and a comparison of accuracy between discharges derived using this technique and measured discharges using standard methods is demonstrated. (Woodard-USGS)
W71-07609

PREDICTING THE DATE OF LAKE ICE BREAKUP,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
G. P. Williams.
Water Resources Research, Vol 7, No 2, p 323-333, Apr 1971. 11 p, 5 fig, 6 tab, 13 ref.

Descriptors: *Ice breakup, *Iced lakes, Melting, Lakes, Lake ice, Forecasting, Heat budget, Energy budget, Statistical methods, Wisconsin, Data collections.
Identifiers: *Canada, *Lake ice breakup.

Standard deviations for lake breakup dates were calculated for all lakes in Canada with reasonably long breakup records and for five lakes in Wisconsin with long-term records. Standard deviations were about 13 days for coastal lakes and 7-11 days for continental lakes. The accuracy of the melting degree day method of predicting breakup dates were investigated for 12 of these lakes; standard deviations ranged from 3.3-8.0 days. Regression equations for predicting breakup dates were developed from past breakup and air temperature records for the 12 lakes; standard errors ranged from 1.6-4.3 days. General forecast guidelines were developed for application to lakes with limited breakup records. The equations and forecast guidelines are suitable only for continental lakes where wind and river inflow effects are not dominant. (Knapp-USGS)
W71-07625

ESTIMATING THE EXTENT OF RIVER SLUSH ICE (K VOPROSU OB OTSENKE STEPENI SHUGONOSNOSTI REK),
For primary bibliographic entry see Field 02E.
W71-07656

2D. Evaporation and Transpiration

THE PRODUCTIVITY OF ZONAL TERRESTRIAL PLANT COMMUNITIES AND THE MOISTURE AND HEAT PARAMETERS OF AN AREA,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
A. V. Drozdov.
Soviet Geography: Review and Translation, Vol 12, No 1, p 54-60, Jan 1971. 3 fig, 1 tab, 13 ref.

Descriptors: *Solar radiation, *Productivity, *Climatic zones, *Heat, *Evapotranspiration, Environmental effects, Plant growth, Moisture availability, Seasonal, Latitudinal studies, Biological communities.
Identifiers: *Dryness index.

Previous studies by Budyko and Grigor'yev indicate that the zonal distribution of plant production is related to the radiation index of dryness, radiation (R)/the amount of heat needed to evaporate the annual precipitation (Lr). They then suggested that: (1) Plant community productivities are maximal when R/Lr is at some optimal valve close to 1.0, and fall off on both sides of the optimal valve at constant R (2) For an optimal R/Lr valve, productivities will increase with increases of absolute valve of the components of the ratio. Unfortunately, their phytomass data did not include below ground portions of the plants and their precipitation figures were low. Using corrected data for 27 communities or zonal landscapes, the author demonstrates relationships between total annual growth of zonal plant communities in various thermal belts and dryness indices, total annual growth at different dryness indices and R, and R vs. R/Lr at different annual growths. Annual growth decreased steadily with increasing R/Lr and increased steadily with R. Increases of growth with R/Lr down to 0.5 (when R is greater than 40 kcal./sq.cm./yr.) indicates that a dryness index close to unity need not necessarily be optimal in all thermal belts. (Casey-Arizona)
W71-07155

EFFECT OF ENVIRONMENTAL FACTORS ON CUTICULAR TRANSPIRATION RESISTANCE,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agricultural Research.
S. Moreshet.
Supported in part by PL480 Grant A10-SWC-29 from the US Department of Agriculture. Plant Physiology, Vol 46, No 6, p 815-818, Dec 1970. 3 fig, 2 tab, 19 ref.

Descriptors: *Cuticle, *Transpiration, *Resistance, *Humidity, *Environmental effects, Mode of action, Laboratory tests, Stomata, Soil moisture, Theoretical analysis, Wettability, Drought resistance.
Identifiers: *Water potential, *Relative humidity.

Plant transpirational water flux takes place via stomatal apertures and through the cuticle. The influences of environmental conditions on cuticular transpiration are not well understood partly because cuticular resistance measurements have usually been made in the dark, assuming stomata were closed. Sunflower (Helianthus annus) plants, with all but the youngest leaf removed, were grown under 3 levels each of soil water potential, light intensity and relative humidity to which the leaves were exposed, allowing 27 different combinations, values of total leaf resistance (calculated from transpiration flux and water concentration gradient measurements) were measured, as well as values of upper and lower transpiration resistance and the sum of stomatal resistances on both sides of the leaf. The only factor affecting citicular transpiration was relative humidity, which was inversely proportional to cuticular resistance to water loss. This response may be explained by drought-caused cuticular shrinkage, alterations in the air-water interface or changes in the wettability of the cuticle. This phenomenon would be a useful adaptation to arid conditions, reducing water loss during drought, but allowing direct absorption of atmospheric moisture or dew during moist periods. (Casey-Arizona)
W71-07156

WATER STRESS AND APICAL DOMINANCE IN PISUM SATIVUM,
Regina Research Station (Saskatchewan).
For primary bibliographic entry see Field 02I.
W71-07283

WATER RESOURCE OBSERVATORY WIND DATA, WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W71-07306

2E. Streamflow and Runoff

WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W71-07135

SERIAL CORRELATION IN ANNUAL STREAM RUNOFF,
Washington State Univ., Pullman. Dept. of Civil Engineering.
Kenneth W. Martig, Jr., and Thomas H. Campbell.
University of Washington, Charles W. Harris Hydraulics Laboratory, Technical Report No 24, June 1968. 43 p, 12 fig, 15 ref, 3 append. OWRR Project A-020-WASH (1).

Descriptors: *Mathematical models, *Streamflow, *Correlation analysis, *Simulation analysis, Hydrology, Forecasting, Planning, Gaging stations, Computer models, Sampling, Data collections, Markov processes, Model studies, Hydrologic data, Runoff.
Identifiers: *Thomas-Fiering algorhythm, *Historic flow records, *Serial correlation.

Using 31 streams of long historic annual stream flow record, the Thomas-Fiering algorhythm was found to be the best mathematical representative of sequential values of annual streamflow. This linear simulation was more accurate than these non-linear methods tested: the Sinh function method, the Three-Degree Polynomial method, the Natural Log of Flow vs. Natural Log Function method, and the One-Degree Markov chain. However, on 25 streams, multiple Markov chains produced the greatest reduction of unexplained error. Markov chains of 6 degrees or multiples of 6 were the most successful. The length of historic streamflow data was found insufficient for residual-number skewness of Kurtosis trends to be treated as anything but random variables, though skewness might appear if longer historic records were available. (Yensen-Arizona)
W71-07151

URBAN HYDROLOGY, HOUSTON METROPOLITAN AREA, TEXAS - 1968,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 04C.
W71-07184

AN APPROACH TO THE SELECTION OF A STREAMFLOW BASE PERIOD,
Wyoming Univ., Laramie. Water Resources Research Inst.
William N. Embree.
Wyoming Water Planning Report No 6, Water Resources Series No 20, July 1970. 112 p, 13 tab, 26 fig, 24 ref. OWRR Project A-001-WYO (33).

Descriptors: *Streamflow, *Synthetic hydrology, *Correlation analysis, *Mass curves, *Statistical methods, Sampling, Wyoming, Gaging stations, Correlation analysis, Water Resources Research Act.
Identifiers: *Base period, Mean, Standard deviation, Variation coefficient.

The 20-year period from 1948 to 1968 provides sufficient information on base period for Wyoming streamflow for 23 representative gaging stations. A base period is defined as a shorter period of record which has the same statistical properties as the longer record, and can be used in simplifying the study of water resources. The mean, standard deviation, and variation coefficient of the base period and long-term record should be similar. There was a 10% or less difference for most streams between 1948 to 1968 and longer records. The 20-year mean is within 6% of the longer mean with 95% confidence, and within 2% of the longer mean with 50% confidence for the Madison River

Related research, methods of analysis, and detailed results are discussed. There are 13 tables of sample size, errors and station descriptions, 26 figures, and 24 references. (Popkin-Arizona)
W71-07188

HYDROLOGIC RECONNAISSANCE OF THE SINK VALLEY AREA, TOOELE AND BOX ELDER COUNTIES UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02F.
W71-07244

WATER RESOURCES OF THE BELMONT-MARTHAVILLE-ROBELINE AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
A. J. Calandro, W. L. Broussard, and R. L. Hosman.
Louisiana Geological Survey and Department of Public Works Water Resources Pamphlet No 25, Nov 1970. 21 p, 1 fig, 5 tab, 10 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Louisiana, *Water supply, Aquifers, Water quality, Reservoirs, Water yield, Water storage, Hydrologic data, Water utilization, Hydrology.
Identifiers: Bayou Dupont (La).

The water-supply sources available for public supplies for Belmont, Marthaville and Robeline, in west-central Louisiana, are appraised. Bayou Dupont and its tributaries cannot provide a dependable water supply for the area without use of storage facilities. At Robeline the stream flows 0.1 cubic foot per second or more 80 percent of the time, and 0.5 cubic feet per second or more can be expected 90 percent of the time. A reservoir on Bayou Dupont at Robeline with 790 acre-feet of storage could sustain a draft rate of 1 million gallons per day. Sediment concentrations during storm periods range from 1,000 to 3,800 milligrams per liter. The average sediment concentrations during other periods are about 300 mg/liter. Fresh groundwater is available from sands of the Wilcox Group. The water is generally soft but locally may be highly colored. The iron content varies and can be high enough to require treatment for removal to be suitable for public supplies. (Woodard-USGS)
W71-07246

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR DEEP CREEK, COLORADO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-07251

A PROPOSED STREAMFLOW DATA PROGRAM FOR ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 07A.
W71-07254

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1970,
Geological Survey, Albuquerque, N. Mex.
A. Basler.
Geological Survey Basic-Data Report (Open file), Mar 1971. 33 p, 8 fig, 4 tab.

Descriptors: *Water resources development, *Surface waters, *Hydrologic data, *Groundwater, New Mexico, Water quality, Water wells, Pumping, Water yield, Water level fluctuations, Streamflow, Runoff, Flow measurement, Precipitation (Atmospheric), Chemical analysis, Data collections, Evaluation.
Identifiers: *White Sands Missile Range (N Mex).

Information on the water resources of the White Sands Missile Range in New Mexico that was collected during the period January 1970 to January 1971 by personnel of the U.S. Geological Survey, Water Resources Division is presented. Data on groundwater pumpage and resulting water-level fluctuation, chemical quality, precipitation, and surface-water runoff are summarized. Total groundwater pumpage at White Sands Missile Range in 1970 was 923,059,000 gallons. Declines of water level occurred in all wells located within a radius of about 1 mile of the middle of the Post Headquarters well field. The chemical quality of water samples collected during 1970 was similar to that of samples collected from the same sources during 1969. The specific conductance of samples collected in December 1969 and 1970 ranged from 242 to 2,580 micromhos in 1969 and from 262 to 2,780 in 1970. Surface-water runoff amounts of 14 acre-feet, and 61 acre-feet were recorded in 1970 at the gage 1 mile north of the Main Gate, and 1.5 miles south of the Main Gate, respectively. During 1969 the runoff at the north gage totalled 132 acre-feet; 96 acre-feet were recorded at the south gage. (Woodard-USGS)
W71-07284

A PROPOSED STREAMFLOW DATA PROGRAM FOR PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 07A.
W71-07299

A PROPOSED STREAMFLOW DATA PROGRAM FOR MARYLAND AND DELAWARE,
Geological Survey, Towson, Md.
For primary bibliographic entry see Field 07A.
W71-07300

A PROPOSED STREAMFLOW DATA PROGRAM FOR MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 07A.
W71-07301

A PROPOSED STREAMFLOW-DATA PROGRAM FOR MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 07A.
W71-07302

PROBABILITIES FOR SIMULTANEOUS OCCURRENCE OF FLOODS IN THE DANUBE AND INN RIVERS BEFORE AND AFTER COMPLETION OF STRUCTURES IN THE DANUBE RIVER,
Gert A. Schultz.
Wasserwirtschaft, Vol 9, p 293-296, 1970. 9 fig, 1 tab, 6 ref.

Descriptors: *Floods, *Flooding forecasting, Synthetic hydrology, Hydraulic structures.
Identifiers: *Danube River, *Inn River.

The flood statistics for the city of Passau reveal that whenever one of these two rivers carried a flood wave the other produces a flood several days after. The Danube peak usually follows the Inn peak. Based on 67 independent flood events between 1926 and 1967, the probability for the 'critical case' (the simultaneous occurence of flood peaks of the Danube and Inn Rivers' confluence) has been investigated and reported herein. An attempt has been made to estimate the influence of hydraulic structures in the Danube river upstream of the confluence on the 'critical case' probability. If this influence can be determined then it is possible to investigate the future tendency of a synthetic flood frequency analysis for the Danube river downstream of the confluence.
W71-07513

EVALUATION OF THE QUANTITY AND QUALITY OF THE WATER RESOURCES OF VOLUSIA COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
Darwin D. Knochenmus, and Michael E. Beard.
Florida Bureau of Geology Report of Investigations No 57, 1971. 59 p, 22 fig, 8 tab, 15 ref, append.

Descriptors: *Water resources development, *Florida, *Aquifers, *Streamflow, Artesian wells, Recharge, Natural recharge, Water yield, Water quality, Water balance, Groundwater movement, Groundwater, Surface waters.
Identifiers: *Volusia County (Fla).

Velousia County includes about 1,200 square miles along the central east coast of Florida. Water use in 1967 averaged about 25.9 mgd, of which the major use (15.8 mgd) was for public supply. In the 20-year interval, 1950 to 1970, the amount of water used for public supply, all of which is groundwater, more than doubled. On the average, it is estimated that 300 mgd is available for man's use. Ninety-five percent of the water used in Volusia County comes from the Floridan aquifer. Recharge to the Floridan aquifer occurs throughout the county wherever the water table in the surface aquifer is higher than the piezometric surface in the Floridan aquifer. In the central part of the county the clastic aquifer is full and rejecting recharge through runoff and evapotranspiration. If the piezometric surface were lowered in this area by withdrawing water from the Floridan aquifer for use, this rejected recharge would be decreased by the capture of water. This would increase the amount of water available for use. The average streamflow is many times larger than the water use for the entire county supply. (Knapp-USGS)
W71-07599

EFFECTS OF MECHANICAL CLEANING OPERATIONS ON FLOW IN LARGE CONDUITS,
Metropolitan Water District of Southern California, Los Angeles. Hydraulic Design Section.
For primary bibliographic entry see Field 08B.
W71-07615

OPERATIONAL HYDROLOGY FOR UNGAGED STREAMS BY THE GRID SQUARE TECHNIQUE,
Department of Energy, Mines, and Resources, Ottawa (Ontario).
R. L. Pentland, and D. R. Cuthbert.
Water Resources Research, Vol 7, No 2, p 283-291, Apr 1971. 9 p, 4 fig, 3 tab, 6 ref.

Descriptors: *Synthetic hydrology, *Simulation analysis, *Streamflow forecasting, Stream gages, Data collections, Planning, Gaging stations, Rainfall-runoff relationships, Mathematical models.
Identifiers: *Canada, *New Brunswick (Canada).

The definition of areal runoff in geographic areas with basically similar hydrologic characteristics can be facilitated by the grid square technique. This technique entails dividing the study area into a uniform grid. Such a procedure provides a means of storing and retrieving information regarding the grid square areas. The grid square technique is used extensively in Canada for assessing water resource potential as well as for planning hydrometric networks. The method can conveniently be extended to generate synthetic streamflow traces on ungaged streams. The grid square technique and its extension to operational hydrology are discussed, along with an example from the New Brunswick region of Canada. (Knapp-USGS)
W71-07622

DERIVATION OF BASE FLOW RECESSION CURVES AND PARAMETERS,
Illinois State Water Survey, Urbana.
Krishan P. Singh, and John B. Stall.
Water Resources Research, Vol 7, No 2, p 292-303, Apr 1971. 12 p, 6 fig, 3 tab, 17 ref.

Descriptors: *Base flow, *Recession curves, *Surface-groundwater relationships, *Water storage, Hydrographs, Hydrograph analysis, Discharge (Water), Streamflow, Streamflow forecasting, Runoff forecasting, Storage coefficient.
Identifiers: *Boussinesq equation.

The Boussinesq equation is used to show that base flow recession is an exponential decay function. For a single peaked hydrograph, the storage delay factor Kb, which is the time for base flow to decrease by a factor of 10, is estimated. The parameter Kb is adjusted by trial so that surface flow, or the observed total flow minus base flow, is also an exponential decay function after the point of inflection on the hydrograph recession. The same parameter for surface flow, Ks, is so determined. For 22 basins in Illinois, the dormant season Kb ranges from 15-100 days and is associated with physiography. Ks varies from 1.8-6.0 days. (Knapp-USGS)
W71-07623

STREAM CHANNELS AND FLOW RELATIONS,
Minnesota Univ., Minneapolis. Dept. of Geography.
Dwight A. Brown.
Water Resources Research, Vol 7, No 2, p 304-310, Apr 1971. 7 p, 2 fig, 3 tab, 4 ref.

Descriptors: *Stage-discharge relations, *Streamflow forecasting, *Flood forecasting, *Channel morphology, Frequency analysis, Open channel flow, Rainfall-runoff relationships, Discharge coefficients, Water levels.
Identifiers: *Channel capacity.

Channel capacity is considered as a reconnaissance technique for estimating mean flow and the magnitude of floods at various expected frequencies. Low flows have diminishing relationships to channel capacity with increasing severity of low flow. Equations were derived to estimate flood magnitudes and provided good results when tested within the same environment. The coefficients of the derived equations lack transferability to different physical environments. (Knapp-USGS)
W71-07624

A STUDY OF THE BASE FLOW CHARACTERISTICS OF THE CHAO PHRAYA RIVER,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Engineering.
Vatana Meevasana.
M Sc Thesis, No 283, Asian Institute of Technology, Bangkok, 1969. 94 p, 19 fig, 19 tab, 28 ref, 3 append.

Descriptors: *Base flow, *Streamflow, *Rainfall-runoff relationships, *Surface-groundwater relationships, Statistical methods, Regression analysis, Mathematical studies, Flow characteristics, Data collections, Hydrologic data, Irrigation, Evaporation.
Identifiers: *Chao Phraya River (Thailand).

Variations of base flow in the Chao Phraya River at Nakhon Sawan, Thailand, are predicted. A statistical method is used to correlate the base flow characteristics with the change in hydrologic and physiographic factors over the drainage basin. Flood season runoff volume, flood peak discharge, and current year rainfall are the indicators of groundwater recharge, but they depend on each other. Since these variables are not independent of each other they are not selected at the same time in a multiple regression equation. Only the most suitable one is selected. Among the various measures describing the carry over storage, the dry season base flow volume of the preceding year gives the most significant correlation to the volume of current year base flow. The water used in irrigation is mainly diverted from the base flow since no large storage dams had been built prior to 1962. The dry season rainfall is less than the accumulated draft on soil moisture due to evapotranspiration. So it creates neither direct runoff nor groundwater recharge to affect the base flow. (Woodard-USGS)
W71-07631

FLOOD HYDROGRAPHS FROM SMALL WATERSHEDS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Engineering.
Chumporn Komsartra.
M Sc Thesis, No 278, Asian Institute of Technology, 1969. 73 p, 29 fig, 6 tab, 19 ref, 6 append.

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Hydrographs, *Model studies, *Streamflow, Flow characteristics, Peak discharge, Mathematical model, Equations, Regression analysis, Methodology, Design flood.

A method for the determination of the peak rate of runoff and the design hydrograph from small ungaged watersheds of drainage area up to 1000 square kilometers is presented. Flood hydrographs from 5 small watersheds were analyzed. The mathematical model, a two parameter gamma distribution, was fitted to the observed hydrograph. The average dimensionless unit hydrograph is recommended for determination of design hydrographs for a tropical regions such as Thailand. The hydrograph parameters are correlated to 4 measurable watershed characteristics including watershed area, length of main stream, length of the stream to the center of the watershed, and slope of the longest watercourse. Two simple empirical equations from regression analysis are presented for determination of hydrograph parameters, peak discharge, and time to peak, which can be used to derive the complete hydrograph. The method is suitable for use in the design of small hydraulic structures such as culverts and highway drainage which usually are constructed on an ungaged watershed. (Woodard-USGS)
W71-07632

EVALUATION OF THE STREAMFLOW DATA PROGRAM IN COLORADO,
Geological Survey, Denver, Colo.
Russell K. Livingston.
Geological Survey Open-file Report, Dec 1970. 72 p, 3 fig, 4 tab, 24 ref, 3 append.

Descriptors: *Streamflow, *Data collections, *Network design, *Colorado, Reviews, Evaluation, Project planning, Project purposes, Stream gages, Hydrologic data, Natural flow, Regulated flow, Regression analysis.
Identifiers: *Streamflow characteristics.

Colorado streamflow information was evaluated to assess the adequacy of the present program and to suggest modifications to improve the program. The ultimate objective is to provide adequate streamflow information at any point on any stream in Colorado. The basic steps in the evaluation were (1) classify streamflow information into four types of data -- current use, planning, and design, long-term trends, and stream environment, (2) define adequacy goals for each type of information, and (3) evaluate the program according to these goals. The results of the evaluation are as follows: (1) Goals for current use are being met. Ten gaging stations no longer needed are being discontinued. (2) Goals for planning and design are not being met. Eighteen additional gaging stations should be installed to provide better areal coverage of principal streams. (3) Goals to define long-term trends can be met by perpetual operation of 15 current gaging stations. (4) Goals on stream environment are not being met. These data are becoming increasingly important and warrant greater effort in the future. (Woodard-USGS)
W71-07634

A PROPOSED STREAMFLOW-DATA PROGRAM IN ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 07A.
W71-07636

HYDROLOGIC STUDIES AND COMPUTATIONS (GIDROLOGICHESKIYE ISSLEDOVANIYA I RASCHETY),
I. T. Krivosheyeva.
Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, 1969. 140 p.

Descriptors: *Discharge (Water), *Hydrologi data, *Regional analysis, *Runoff forecasting *Hydrograph analysis, Discharge measurement Runoff, River basins, Rainfall-runoff relationship Statistical methods, River flow, Climatic data Mathematical studies, Hydrographs, Computer Inflow, Gaging stations, Flooding, Water balance Groundwater recharge.
Identifiers: *Ukraine, Dnieper River, Dniester River, Carpathian Mountains, Danube River Crimea.

This issue of the serial publication contains 14 arti cles, a number of which deal with methods used t compute maximum discharges from melt and rai waters. In several of the articles the 'Promin' com puter is mentioned as a possible means of perform ing computations. A method for forecasting sprin runoff from rivers of the Dniester Basin is advance along with a method for studying asynchronou fluctuations in hydrometeorological phenomena b means of stochastic matrices. Considerable atter tion is paid to the formation conditions of dry weather flow and the ice-heat regime, classificatio of torrential mudflows, and to the perfecting of a electrolytic method for measuring wate discharges. (See also W71-07648 thru W71 07658) (Josefson-USGS)
W71-07647

USE OF THE 'PROMIN' COMPUTER FOR CAL CULATING THE EFFECT OF A RIVER BASI RESERVOIR ON MAXIMUM WATE DISCHARGES (RUSSIAN: OPY PRIMENENIYA EVM 'PROMIN DLY RASCHETA VLIYANIYA VODOH HRANILISHCHA V BASSEYNE REKI NA MA SIMAL 'NYYE RASKHODY VODY),
T. A. Chekushkina.
In: Gidrologicheskiye isseldovaniya i raschet Ukrainskiy Nauchno-Issledovatel'ski Gidrometeorologicheskiy Institut Trudy, No 8 Gidrometeoizdat, Moscow, p 16-26, 1969. 10 p, fig, 4 tab, 10 ref.

Descriptors: *Discharge (Water), *Reservoir *Hydrographs, *Hydrograph analysis, Time la River basins, Computers.
Identifiers: *Ukraine, Dnieper River, Travel time.

A method for computing high water discharges b taking into account the regulating effect of a rese voir is described. Over 50 rivers in the Dniep Basin are examined for studying patterns in the i crease of water basin areas according to riv length and for analyzing the distribution of wat basin areas based on this length. Discharges from basin separated by a reservoir are represented the sum of transformed discharges from an upp partial water basin, enclosed between the outl and discharge site of a reservoir dam, a discharges from a lower partial water bas removed from the dam to the outlet. Discharg from partial reservoirs are derived from a genet runoff formula corrected by lag coefficients, whi take into account the degree of transformation discharge from sections between isochrones. 'Promin' computer has been used to eliminate t drudgery of computations associated with compu ing hydrograph discharges. Nomograms have be prepared showing coefficients of decrease in ma imum discharges from the basin as a whole a from the upper partial water basin as a function time lag. (See also W71-07647) (Josefson-USGS)
W71-07648

CALCULATIONS OF HIGH WATE DISCHARGES ON THE 'PROMIN' COMPUTE (RASCHETY RASHHODOV POLOVOD'YA N EVM 'PROMIN'),
V. I. Moklyak, and N. S. Snesareva.
In: Gidrologicheskiye issledovaniya i raschet Ukrainskiy Nauchno-Issledovatel'sk Gidrometeorologicheskiy Institut Trudy, No 8 Gidrometeoizdat, Moscow, p 27-29, 1969. 3 p, tab, 1 ref.

Descriptors: *Discharge (Water), *Hydrographs, *Computers, *Hydrograph analysis, Time lag, Model studies, Reservoirs, Inflow, Regulated flow, Channel flow.
Identifiers: *Ukraine.

Hydrograph discharges were calculated on a computer by successive remultiplication of the ordinates of a unit hydrograph by the volume of inflow from an entire basin, by summing up partial discharges on the basis of their simultaneous lag. Discharges were calculated on the 'Promin' computer in two programs: 'Vesna-I' on six punch cards for determining the ordinates of the unit hydrograph and 'Vesna-II' on ten punch cards for determining discharges of the hydrograph. About 100 unit hydrographs, which took into account the varied duration of time lag and typical charts of basin width, were calculated on the 'Promin' computer. Charts of inflow were expressed by four models. About 400 hydrographs were prepared for determining the effect of hydrographic, meteorological, hydraulic, biological and other factors on high water discharge. (Josefson-USGS)
W71-07649

TYPICAL CHARTS OF UNIT INFLOW OF HIGH WATERS FROM LOWLAND RIVERS OF SOUTHWESTERN EUROPEAN USSR (KHARAKTERNYYE GRAFIKI ELEMENTARNOGO PRITOKA VYSOKIKH POLOVIDIY MAVNINNYKH REK YUGO-ZAPADA EVROPEYSKOY TERRITORII SSSR),
Ya. A. Fomenko.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85, Gidrometeoizdat, Moscow, p 30-79, 1969. 50 p, 1 fig, 1 tab, 11 ref, append.

Descriptors: *River basins, *Melt water, *Inflow, *Hydrologic data, *Discharge (Water), Gaging stations, Hydrographs, Runoff, Runoff coefficient, Meteorology, Peak discharge.
Identifiers: *Ukraine, Dnieper River, Southern Bug River, Severskiy Donets River, Azov Sea, Balance method, Peak flow.

The unit inflow of melt waters from a basin into a channel system during high water periods is examined. The daily rate of unit inflow from small and average-size water basins is derived by the balance method by means of retransformation of recorded high water discharges. Data on daily inflow rate, its maximum and total value, duration of unit inflow and the ratio of peak to basin yield during high waters were determined from 244 gaging stations on lowland rivers of the Dnieper, Southern Bug, Severskiy Donets and Azov Sea Basins. Unit inflow charts expressed in percent may be used in hydrologic computations for constructing hydrographs of infrequently recurring spring high waters on the basis of a total runoff layer of given probability. A small daily difference in layers may be due simply to local characteristics of runoff formation, distribution of snow storage on the water basin or inaccurate measurement of high water runoff. (See also W71-07647) (Josefson-USGS)
W71-07650

A METHOD FOR FORECASTING SPRING RUNOFF FROM RIVERS IN THE DNIESTER BASIN (METODIKA PROGNOZA VESENNEGO STOKA REK BASSEYNA DNESTRA),
V. V. Shcherbak.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 80-84, 1969. 5 p, 4 fig, 1 tab, 6 ref.

Descriptors: *Runoff, *Rainfall-runoff relationships, *Runoff forecasting, *Rivers, Snowmelt, Seasonal, Precipitation (Atmospheric), Statistical methods, Thawing, Water balance, Discharge (Water).
Identifiers: *Ukraine, Dniester Basin.

A study of spring runoff conditions for the Dniester River and several of its tributaries has revealed that there is a relationship between spring runoff and snow storage at the start of thaw and the amount of precipitation during a high water period. Despite a high correlation coefficient between snow storage at start of thaw and spring runoff (0.74), the amount of precipitation during the high water period is a major factor in the formation of runoff. In rivers of the mountain part of the basin, where the major share of Dniester spring runoff is formed, the rain component in high water runoff is 40-50%, increasing during individual years to 60-70%. The amount of snow storage and precipitation for partial water basins is determined by averaging the readings of stations located at these water basins or nearby. An index of average snow storage in the Dniester Basin to Mogilev-Podol'skiy and of precipitation during the high water period is determined as the weighted mean of these amounts, based on their participation in runoff, for the right and left banks of the basin. The closeness of the relationships obtained is quite sufficient for use in calculating and forecasting magnitude of spring runoff. (See also W71-07647) (Josefson-USGS)
W71-07651

A METHOD FOR STUDYING ASYNCHRONOUS FLUCTUATIONS IN HYDROMETEOROLOGICAL PHENOMENA BY STOCHASTIC MATRICES (RUSSIAN: METOD ISSLEDOVANIYA ASINKHRONNOSTI KOLEBANIY GIDROMETEOROLOGICHESKIKH YAVLENIY S POMOSHCH'YU STOKHASTICHESKIKH MATRITS),
M. M. Voronchuk, and Yu. V. Shveykin.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 92-98, 1969. 7 p, 2 fig, 7 ref.

Descriptors: *Stochastic processes, *Probability, *Fluctuation, *Meteorology, Computers, Runoff, Precipitation (Atmospheric).
Identifiers: *Ukraine, Danube River, Dnieper River.

A method is proposed for studying asynchronous fluctuations in hydrometeorological phenomena. It is based on comparing a matrix of the distribution of empirical probabilities of simultaneous appearance of specific values for two random variables and a matrix of the theoretical probabilities of a simultaneous appearance of the same values for these variables calculated from the assumption that the values under consideration vary independently of one another. Comparison and analysis of these matrices make it possible to determine the probabilities of a simultaneous appearance of any recorded values for these variables and to introduce a probability measure of the relationship of various values to these variables. The merit of this method lies in the possibility of studying simultaneous change in both homogeneous and heterogeneous variables as well as in the possibility of estimating the degree of their interrelationship. Because of the difficulty of computing elements of stochastic matrices, all calculations were performed on the 'Ural-4' computer, with the time required to compute one total probability of a matrix not exceeding 20-25 minutes. The example used for study was the asynchronous runoff from the Danube and Dnieper Rivers and the asynchronous runoff from the Dnieper together with precipitation in the irrigation zone. (See also W71-07647) (Josefson-USGS)
W71-07653

DRY-WEATHER FLOW OF TRANSCARPATHIAN MOUNTAIN RIVERS (RUSSIAN: MEZHENNY STOK GORNYKH REK ZAKARPAT'YA),
K. A. Lysenko, and L. K. Sinitskaya.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 99-103, 1969. 7 p, 2 fig, 1 tab, 2 ref.

Descriptors: *Runoff, *Low flow, *River flow, Rivers, Steady flow, Seasonal, Hydrogeology, Precipitation (Atmospheric), Meteorological data, Groundwater movement.
Identifiers: *Ukraine, Carpathian Mountains, Dry-weather flow, Regionalization.

An analysis of data for the low water period of Transcarpathian mountain rivers has revealed that there is a direct relationship between precipitation and runoff during a summer low water period. Maximum runoff values for a summer low water period (200-329 mm), lasting 100-140 days, were observed at the upper reaches of the Teresva and Tereblya Rivers and on the Belaya Tissa and Shopurka Rivers. For the other mountain rivers of Transcarpathia runoff values decreased in a west to southwest direction from 80-170 to 50-80 mm. Maximum runoff values for a winter low water period (60-129 mm), lasting 80-100 days, were typical of the mountain area, with runoff values decreasing gradually to 40-60 mm toward the foothills. Based on an established relationship between dry-weather flow and hydrogeological conditions, an attempt was made to determine the volume of runoff of a summer and winter low water period for rivers for which there were no runoff data. Two hydrogeological regions were distinguished within which the character of dry weather flow was identical to that of rivers for which there were hydrometric observation data. An analysis of runoff during low water periods revealed that there was considerable fluctuation in runoff owing to the varied extent to which the river valley incised underlying rock materials, draining of groundwater horizons into the river valley and to a diversified distribution of precipitation. (See also W71-07647) (Josefson-USGS)
W71-07654

HEAT REGIME CHARACTERISTICS OF RIVERS IN THE DANUBE AND DNIESTER BASINS (NEKOTORYYE OSOBENNOSTI TERMICHESKOGO REZHIM REK V BASSEYNAKH DUNAYA I DNESTRA),
N. G. Dyukel'.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Insitutu Trudy, No 85; Gidrometeoizdat, Moscow, p 104-111, 1969. 8 p, 4 fig, 4 tab, 5 ref.

Descriptors: *Heat balance, *Water temperature, *Base flow, *Groundwater recharge, Climatic data, Groundwater basins, River basins, Rivers.
Identifiers: *Ukraine, Danube River basin, Dniester River basin, Heat regime.

An analysis of the heat regime of rivers in the Danube and Dniester basins has established that heat regime characteristics differ for river reaches which have a moderate and high groundwater recharge. The heat regime for river reaches with an abundant groundwater outflow is determined more by the extent to which groundwaters participate in total runoff and by groundwater temperature than by climatic factors. The heat regime for river reaches with moderate groundwater recharge is determined by climatic characteristics, primarily air temperature. Since vertical zonality in distribution of air temperature is noted for Danube and Dniester basins, this zonality must be considered in the heat regime characteristics for river reaches with a moderate groundwater recharge. Vertical zonality in the distribution of the water temperature' of rivers in these basins makes it possible to establish relationships between heat regime characteristics (average long-term monthly water temperature values, dates of steady change in 0.2 deg increments in spring, and average rate of increase and decrease in water temperature values from month to month) and height of terrain. The relationship T—f (H) can be used to determine long-term average monthly water temperature values for rivers still unstudied. (See also W71-07647) (Josefson-USGS)
W71-07655

ESTIMATING THE EXTENT OF RIVER SLUSH ICE (K VOPROSU OB OTSENKE STEPENI SHUGONOSNOSTI REK),
N. G. Dyukel'.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 112-117, 1969. 6 p, 1 fig, 2 tab, 4 ref.

Descriptors: *Ice, *Ice jams, *Melting, *Thawing, *Seasonal, Rivers, River basins, Geomorphology, Hydrologic data.
Identifiers: *Slush ice, *Ukraine, Danube River, Dniester River, Southern Bug River, Carpathian Mountains.

The absence of quantitative descriptions of river slush ice necessitates finding indirect means of estimating slush ice formation because of its significant effect on normal operation of hydraulic structures. A very convenient index for estimating river slush ice is the number of ice jams recorded over the course of a winter on a certain reach of the river. In the mountain regions (Tissa and Prut River basins) conditions most favorable for intensive slush ice formation occur during very cold winters when the number of days with thaw periods is 50-60% of the norm. On rivers of the Dniester basin (a large part of which is in the Carpathian foothills) slush ice formation is most vigorous during near-normal winters when the number of days with thaw periods is 80-100% of the norm. On the lowland rivers of the Southern Bug basin Optimal conditions for formation of slush ice are created during normal winters when the number of days with thaws is 100-120% of the norm. The extent of slush ice formation and optimal conditions for its formation on rivers in the area examined can be determined from graphs showing the relationship between the number of ice jams per winter and the severity of the season. (See also W71-07647) (Josefson-USGS)
W71-07656

CLASSIFICATION AND REGIONALIZATION OF TORRENTIAL MUDFLOWS IN THE UKRAINIAN CARPATHIANS (KLASSIFIKATSIYA SELEY I RAYONIROVANIYE BASSEYNOV SELEOPASNYKH REK UKRAINSKIKH KARPAT),
M. M. Ayzenberg, M. L. Vol'ftsun, and Ye. V. Khloyeva.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 118-124, 1969. 7 p, 1 fig, 1 tab, 23 ref.

Descriptors: *Mudflows, *Sediments, *Erosion, *Regional analysis, *Sediment-water interfaces, Flooding, Flash floods, Orography, Alluvium, Petrography, Rocks, Particle size, Runoff, Vegetation.
Identifiers: *Ukraine, *Torrents, *Torrential flow, Carpathian Mountains.

Studies made in 1965-1967 of Carpathian Mountain river mud basins and torrential mudflows have suggested a new classification scheme for these mud basins. The new scheme takes into account the physico-geographic characteristics of the basins (altitude, plant cover, rocks, mud-fraction composition), maximum surface runoff, mudflow density and maximum amount of alluvium (considering the entire and denuded area of water basin), loss of alluvium by mudflow and the most probable type of torrential mudflow. Three categories of mudflow are differentiated for these basins: heavy, medium and light. Based on physico-geographic characteristics the Ukrainian Carpathians are divided into 3 mudflow areas--the northwestern, southwestern and southeastern--with a further division into subareas. A list of principal mud-laden rivers for each subarea is indicated along with the years in which mudflows were most frequently observed. (See also W71-07647) (Josefson-USGS)
W71-07657

DETERMINING WATER DISCHARGE BY ELECTROLYSIS WITHOUT FIELD CALIBRATION OF ELECTRODES (OPREDELENIYE RASKHODOV VODY ELEKTROLITICHESKIM SPOSOBOM BEZ POLEVOY TARIROVKI ELEKTRODOV),
N. V. Pikush.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 130-134, 1969. 5 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Electrolysis, *Discharge measurement, *Discharge (Water), Electrodes, Calibrations, Mathematical studies.
Identifiers: *Ukraine, Water electroconductivity.

Further study was made of the technical characteristics of an electrolyte water discharge gage and of the properties of a saturated water solution of common table salt. To determine water discharge by the electrolytic method without recourse to field calibration of electrodes, the following method was used. A saturated water solution of common table salt was prepared by pouring any grade of salt into a vessel and adding 1 liter of water for every 400 g of salt. After repeated mixing the solution was left to stand for at least 20 minutes until completely clear. During this time electrodes were properly secured, the instrument adjusted and water temperature and water level measured. Then, following usual procedures, the volume of solution introduced to the current was precisely measured and observations made during the entire period of passage of the ion cloud across the electrode alignment for electrolytic measurement of water discharge. By using this method, water discharges by electrolytic means were determined more rapidly and with greater accuracy. (See also W71-07647) (Josefson-USGS)
W71-07658

WATER RESOURCES ASPECTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07661

FOREST INFLUENCE ON RIVER FLOWS,
State Hydrological Inst., Leningrad (USSR)
For primary bibliographic entry see Field 04A.
W71-07689

2F. Groundwater

DETERMINATION OF IN SITU HYDRAULIC PARAMETERS IN JOINTED ROCK,
Imperial Coll. of Science and Technology, London (England).
C. Louis, and Y. N. Maini.
Proceedings 2nd Congress International Society of Rock Mechanics, Theme 1, No 32, Belgrade, Yugoslavia, Sept 1970. 11 p, 9 fig, 16 ref.

Descriptors: *Rocks, *Joints (Geology), Fissures, *Permeability, Pumping tests (Wells), Field tests, Test procedures, Bibliographies, *Hydraulic conductivity, *Groundwater flow, Groundwater movement, Groundwater geology, Geology.

The theory of waterflow through jointed rock has undergone rapid advancement in recent years. Digital and analog computers can now be applied to very large 2- and 3-dimensional problems, but the application of these methods is completely inadequate if no in situ hydraulic parameters are available. Most field test interpretation is based on the classical soil mechanics theory of flow through a continuum, and consequently leads to incorrect results in jointed rock. The rock is assumed to be divided by several sets of parallel joints. The problem of determining the rock mass hydraulic parameters is dealt with theoretically. Field testing requirements include either a pumping test (pumping into or out of a borehole or gallery) or a dilution test. Practical suggestions regarding the performance of these tests in the field are given. H
16 references. (USBR)
W71-07075

ANALYSIS AND EVALUATION OF PUMPIN TEST DATA,
International Inst. for Land Reclamation and Im provement, Wageningen (Netherlands); and I stitute for Land and Water Management Researc Wageningen (Netherlands).
G. P. Kruseman, and N. A. De Ridder.
International Institute for Land Reclamation a Improvement, Bulletin 11, 1970. 200 p, 29 tab, ref, 61 fig, 175 equations.

Descriptors: *Aquifers, *Pumping, *Analytic techniques, *Hydrologic equation, *Hydraulic Testing, Aquifer characteristics, Permeabilit Transmissivity, Storage coefficient, Hydrolog properties, Hydraulic models, Test procedur Drawdown, Artesian wells, Evaluation, Da processing, Groundwater, Darcy's Law, Stea flow, Unsteady flow, Dewatering, Boundaries (Su faces), Anisotropy, Approximation method.
Identifiers: Variable discharge.

This is a guidebook for analyzing and evaluati pumping test data. Pumping tests help assess t groundwater resource, the major water source arid and semi-arid lands. The introduction giv definitions and discusses Darcy's law, aquifer typ hydraulic properties and types of flow equatio General set-up, performance and data analysis pumping tests are described. Chapter three giv methods of analyzing steady-state and unstead state flow in confined, semi-confined and unco fined aquifers, and unsteady-state flow in unco fined aquifers with delayed yield and in semi-u confined aquifers (Boulton's method). Chap four presents methods of analyzing the spec cases of aquifers limited by one or more bound ries, anisotropic aquifers, wedge-shaped aquife sloping aquifers, aquifers pumped at a varia discharge rate, partially penetrated aquife aquifers pumped by a large diameter well, tw layered semi-confined aquifers, approximati methods and free flowing wells. Corrections a unit conversions are discussed. Examples method application are given. There are 11 w function tables, and 18 tables of empirical, a conversion data. (Popkin-Arizona)
W71-07166

CHARACTERIZATION OF WATER TABLES OREGON SOILS WITH REFERENCE TO TRA FICABILITY,
Army Engineer Waterways Experiment Stati Vicksburg, Miss.
L. Boersma, and G. H. Simonson.
Sponsored by US Army Materiel Comma prepared under contract with Department of So Oregon State University, Corvallis, Oregon. Army Engineer Waterways Experiment Stati Vicksburg, Mississippi, Contract Report M-70 May 1970. 2 vols--Vol I: Data, 235 p; Vol II: Ana sis, 108 p. 1T021701A046 and 1V025001A1 Task 02.

Descriptors: *Water table, *Soil moisture, *Tr ficability, *Soil strength, *Soil tests.
Identifiers: *Oregon soils.

Three near-model test sites were established each of five soil series of the Willamette Catena western Oregon. Field and laboratory tests on s from 15 test sites were initiated in the fall of 19 and terminated in summer of 1965. Objectives study were to (1) determine whether particu water table regimes are associated with specific s types, (2) achieve the capability for apprais water table regimes from soil morphological inf mation, and (3) gain background knowled needed in the development of prediction meth for water table depths, soil moisture contents, a soil strengths. Data obtained daily at each site cluded maximum and minimum air temperatur precipitation, groundwater depths, and electr

esistance measurement of soil moisture content nd temperature. Data obtained periodically in-luded gravimetric soil moisture contents, soil trengths, and the state of the ground and vegeta-on. Data on Atterberg limits, grain-size distribu-ons, specific gravities, organic matter contents, oisture contents at specified tensions, dry densi-es, site descriptions, and soil profile descriptions ave been condensed and presented in tabular and raphic form. Analysis of data is presented in Vol . (Spivey-WES)
71-07173

ROUNDWATER POLLUTION FROM SANITA-Y LANDFILLS AND REFUSE DUMP ROUNDS, A CRITICAL REVIEW,
larquette Univ., Milwaukee, Wis. Dept. of Civil ngineering.
or primary bibliographic entry see Field 05E.
71-07194

YDROLOGIC RECONNAISSANCE OF THE NK VALLEY AREA, TOOELE AND BOX LDER COUNTIES UTAH,
eological Survey, Salt Lake City, Utah.
on Price, and E. L. Bolke.
tah Department of National Resources Technical ublication No 26, 1970. 34 p, 3 fig, 1 plate, 8 tab, 2 ref.

escriptors: *Groundwater basins, *Water sources, *Hydrogeology, *Deserts, *Utah, roundwater, Water balance, Water quality, ydrologic data, Data collections, Recharge, ischarge (Water).
entifiers: Sink Valley (Utah).

he Sink Valley (Puddle Valley) area covers about 0 square miles between Great Salt Lake and the reat Salt Lake Desert in northwestern Utah. It is a y, sparsely populated area utilized partly as a ilitary reservation and partly as winter range for eep. Normal annual precipitation in the area nges from less than 6 inches in the lowlands to a aximum of about 12 inches in the mountains. ecause of a high potential evaporation (estimated be about 58 inches a year), there is virtually no erland runoff from the area and very little oundwater recharge. All streams in the area are y most of the year. The principal source of water groundwater that occurs chiefly under water ole conditions in unconsolidated and partly con-lidated Quaternary and Tertiary valley fill. Sand d gravel aquifers in the valley fill yield as much as ew hundred gallons of water per minute to wells. owever, the water generally contains more than 000 mg/liter of dissolved solids, and mineral con-nt of the water increases with depth. The prin-pal dissolved constitutents generally are sodium d chloride. In 1967, about 37 acre-feet of water s pumped and demineralized for domestic pply at the Hill Air Force Range. An average of out 1.5 acre-feet per year is pumped for stock. e annual recharge is about 1,000 acre-feet. tural discharge from the reservoir, which occurs tirely as subsurface outflow, is also about 1,000 re-feet per year. The small quantity and the poor ality of the water are the principal limiting fac-s in any major development of water resources Sink Valley and the adjacent areas. (Knapp-GS)
71-07244

ATER RESOURCES OF THE BELMONT-ARTHAVILLE-ROBELINE AREA, LOUI-ANA,
ological Survey, Baton Rouge, La.
r primary bibliographic entry see Field 02E.
71-07246

THE QUESTION OF THE ORIGIN OF THE STEIN THERMAL WATERS, (ZUR FRAGE DER HERKUNFT DES GASTEINER THERMAL-WASSERS),
Innsbruck Univ. (Austria). Balneology Inst.; and Society of Hydrogeological Scientists, Graz (Austria).
C. Job, and J. Zotl.
Steirische Beitrage Zur Hydrogeologie, Graz, 1969, (Separate printing). 115 p, 19 fig, 11 tab, 33 ref.

Descriptors: *Thermal water, *Mineral water, *Hot springs, *Water circulation, Provenance, Water chemistry, Mineralogy, Tracers, Radioisotopes, Stable isotopes, Recharge, Discharge (Water), Water yield.
Identifiers: *Gastein (Austria), *Austria.

The cold waters of the Gastein area do not penetrate deep into the mountainous body and run off close to the surface, and are simple Ca-bicarbonate waters. As the depth of infiltration increases, sulfates created by the oxidation of sulfidic ores become predominant, and the Na-content of the waters increases by Ca/Na-exchange; the water in deep situated joints then contains all the ions typical of the Gastein thermal waters, except the chlorides. Chemical content as well as tritium content showed that springs may increase their yield by increased hydrostatic pressure in the recharge area. There is also fluctuating discharge of the pure deep thermal waters. The delta C-14 values of the carbonates of the hot waters closely approach the ideal value for vadose waters, from which it may be concluded that biogenic CO2 took an essential part in the dissolution of these carbonates and that, therefore, the main body of the Gastein thermal waters is infiltrated precipitation water. This result is confirmed by the C-14 analyses. (Knapp-USGS)
W71-07252

A PROBLEM OF SUBSIDENCE IN A LIMESTONE TERRANE AT COLUMBIANA, ALABAMA,
Geological Survey, University, Ala. Water Resources Div. and Geological Survey of Alabama, University.
W. J. Powell, and P. E. LaMoreaux.
Alabama Geological Survey Circular 56, 1969. 30 p, 22 fig, 1 ref.

Descriptors: *Land subsidence, *Withdrawal, *Limestones, *Alabama, Aquifers, Subsidence, Karst, Faults (Geology), Pumping, Municipal water, Water yield, Aquifer characteristics, Carbonate rocks.
Identifiers: *Columbiana (Ala).

The effects and possible causes of subsidence at Columbiana, Alabama, were studied to aid in suggesting a means of preventing further subsidence in the area. The subsidence damaged several buildings, a Federal housing project, endangered the concrete filter plant and elevated water storage tank, broke water lines, and severed the tracks of the Louisville and Nashville Railroad. The area most seriously affected by subsidence was at the site of the municipal water filter plant. Subsidence is common in areas underlain by limestone. At Columbiana, most of the subsidence was confined to the material above the limestone in a zone consisting of clay, shale, slate, sand, and gravel, and occurred in an area adjacent to the trace of the Wilsonville fault. Removal of silt, sand, calcareous and colloidal material by groundwater movement reduced the bearing strength of the overlying material. Continuous pumping from municipal wells 1 and 2 has created a cone of depression in the groundwater reservoir causing groundwater to move from all sides of this depression toward the center. The sediment present in the muddy water pumped from municipal wells 1 and 2 evidently is material removed primarily from the zone above bedrock. Development of 2 municipal wells at Kewahatchie Spring about 8 miles southeast of Columbiana will alleviate the water shortage and help alleviate subsidence. If pumping is continued from wells 1 or 2, even on a temporary basis, additional subsidence could be triggered. Surface cracks, particularly in the vicinity of well 2, should be filled. (Knapp-USGS)
W71-07253

A SIMPLE METHOD OF GROUNDWATER DIRECTION MEASUREMENT IN A SINGLE BORE HOLE,
Irrigation Research Inst., Lahore (Pakistan).
Mohammad Saleem.
Journal of Hydrology, Vol 12, No 4, p 387-410, Mar 1971. 24 p, 11 fig, 2 ref, 2 append.

Descriptors: *Groundwater movement, *Tracers, *Tracking techniques, *Water wells, Aquifers, Flow, Porous media, Boreholes, Subsurface investigations.
Identifiers: *Groundwater tracing.

A simple tracer technique may be used to find both the magnitude and direction of groundwater flow in a single borehole sited in a pervious water bearing medium. At any given horizon where velocity measurements are required, the strainer of the borehole is divided into three regions, each about 10 cm long. The central region has slits all around. The top region consists of two equal semicircular halves, each subtending an angle of 180 degrees at the axis of the strainer, and one-half has slits cut in it as usual while the second half is kept completely closed. The lower region is similarly constructed to the top one except that its reference line leads or lags behind the reference line of the top region by an angle of 45 degrees. For proper separation of these three regions, there are buffer zones between any two consecutive regions. Inactive potassium bromide solution is injected in all the three regions. Using three independent brass electrodes, one in each of the three regions, electrical conductivities at regular intervals of time are carried out by using low frequency and low voltage alternating current, the common electrode being the strainer itself. The magnitude of flow can be determined from the information collected from the central region; the data from the top and lower regions give the direction of flow. (Knapp-USGS)
W71-07269

DIGITAL COMPUTER SOLUTIONS OF GROUNDWATER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton, and L. M. Tomlinson.
Journal of Hydrology, Vol 12, No 4, p 339-362, Mar 1971. 24 p, 11 fig, 1 tab, 8 ref, 2 append.

Descriptors: *Groundwater movement, *Numerical analysis, *Computer programs, Hydrogeology, Flow, Porous media, Recharge, Infiltration, Withdrawal, Networks, Digital computers, Mathematical models, Model studies, Analog models.
Identifiers: Implicit methods.

This paper examines critically the use of the alternating direction implicit method for solving groundwater flow problems. Comparisons with alternative solutions show that inaccuracies can arise if the time increments are too large. A method is suggested whereby the computer chooses an optimum time increment. The representation of recharge, infiltration and wells is considered and a detailed example compares the alternating direction implicit, the explicit and the resistance-capacitance network methods. (Knapp-USGS)
W71-07273

TWO DIMENSIONAL HEAT TRANSFER IN POROUS MEDIA WITH STEADY-STATE WATER FLOW,
California Univ., Davis. Dept. of Water Science and Engineering.
K. T. Erh, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol 35, No 2, p 209-214, Mar-Apr 1971. 6 p, 12 fig, 1 tab, 18 ref.

Descriptors: *Heat transfer, *Soil water movement, *Porous media, Clays, Saturated flow, Conduction, Diffusion, Heat flow, Mass transfer, Thermal conductivity, Instrumentation, Laboratory tests, Mixing, Water temperature.

Identifiers: Apparent thermal conductivity.

Theoretical and experimental temperature distributions were examined for laboratory columns of Hanford sandy loam, Panoche clay loam, and Aiken clay saturated with water flowing at a constant rate. The temperature of the water entering the columns was kept below or above the ambient temperature for several values of soil water velocity. Temperature distributions were predicted as a function of flow velocity, radial size, apparent thermal conductivity, and the wall heat transfer coefficient of the cylindrical container for the soil. Values of the apparent axial and radial thermal conductivity depend upon the flow velocity at values less than 0.3 cm per min with only one exception. The value of the axial thermal conductivity was 1.1 greater than that of the radial thermal conductivity for all soils and flow velocities. Increasing the soil column radius had the same effect on the temperature distributon as increasing the water velocity. (Knapp-USGS)
W71-07279

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1970,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 02E.
W71-07284

WATER LEVELS IN ARTESIAN AND NONARTESIAN AQUIFERS OF FLORIDA, 1967-68,
Geological Survey, Tallahassee, Fla.
Henry G. Healy.
Florida Bureau of Geology Information Circular No 68, 1971. 61 p, 51 fig, 1 tab.

Descriptors: *Florida, *Aquifers, *Groundwater, *Artesian wells, *Hydrologic data, Water level fluctuations, Hydrographs, Observation wells, Precipitation (Atmospheric), Rainfall, Chlorides, Confined water, Data collections.
Identifiers: Groundwater data (Fla).

This report summarizes the trends and fluctuations of groundwater levels in the principal aquifers in Florida during 1967-68 and includes: (1) hydrographs of groundwater levels in the several aquifers; (2) maps showing changes in groundwater levels during specific periods; and, (3) a table summarizing the principal data on selected observation wells. The locations, aquifers, and types and periods of records available for 3,600 observation wells are tabulated. (Josefson-USGS)
W71-07285

GROUNDWATER RESOURCES OF ARANSAS COUNTY, TEXAS,
Geological Survey, Austin, Tex.
G. H. Shafer.
Published and distributed by the Texas Water Development Board, PO Box 13087, Austin, Texas 78711. Texas Water Development Board Report 124, Dec 1970. 81 p, 22 fig, 10 tab, 32 ref.

Descriptors: *Water resources development, *Groundwater, *Hydrogeology, *Hydrologic data, *Texas, Data collections, Water resources, Aquifers, Aquifer characteristics, Water levels, Water level fluctuations, Water yield, Water wells, Water quality, Salinity, Consumptive use, Chemical analysis, Irrigation, Industrial water, Domestic water.
Identifiers: *Aransas County (Tex).

The aquifers that yield water to wells in Aransas County, Texas are the Gulf Coast aquifer, mostly of Pliocene and Pleistocene age, that underlies the entire county; the Pleistocene barrier island and beach deposits, which are restricted to the peninsulas; and the Holocene barrier island deposits, which are restricted to St. Joseph Island. Almost all groundwater needed for public supply and industrial use is obtained from the Gulf Coast aquifer that underlies Live Oak Peninsula. During 1966, about 1,600 acre-feet of groundwater was pumped for all purposes in the county. About 672 acre-feet was for public supply, 342 acre-feet for industrial use, and 580 acre-feet for rural domestic and livestock use. One of the principal factors limiting the development of moderate supplies of groundwater is the threat of salt-water intrusion from sands underlying the fresh-water zone. The most satisfactory method of disposal of salt water is by the use of injection wells, but in 1961 only 500 barrels (0.06 acre-foot) of salt water produced from oil wells in Aransas County was disposed by this method. (Woodard-USGS)
W71-07292

GROUNDWATER IN ONTARIO, SOUTH-EASTERN AREA, 1960 TO 1964.
Ontario Water Resources Commission, Toronto. Div. of Water Resources.

Ontario Water Resources Commission, Water Resources Bulletin 2-8, Groundwater Series, 1970. 307 p, 2 fig, 8 tab, 4 append.

Descriptors: *Water resources, *Groundwater, *Hydrologic data, *Data collections, Water wells, Geology, Aquifers, Aquifer characteristics, Hydrology, Topography, Meteorology, Drainage, Hydrogeology, Water sources, Water level fluctuations, Observation wells, Water utilization, Water resources development.
Identifiers: *Ontario (Canada), Well logs, Well data.

This report contains groundwater information assembled for the southeastern area of Ontario for the period 1960 to 1964. The information is directed to individuals interested in groundwater conditions in areas where they wish to drill wells; by drillers who are interested in hydrogeologic conditions in areas other than where they normally operate; by town planners, engineers, and geologists, who are searching for major aquifers to supply municipalities with groundwater; and by engineers, geologists and others who are seeking favorable sites for gravel pits, quarries, or other deposits of economic value. The western part of the area mainly in the counties of Renfrew and Frontenac and partly in the counties of Leeds and Lanark, is underlain predominantly by Precambrian rocks and the topography is quite variable. The elevation varies from an altitude of about 240 feet at the St. Lawrence River near Brockville, to a height of 1,725 feet above sea level southeast of Killaloe Station. In the eastern part of the area the land is underlain by Paleozoic rocks. Here, the elevation varies from an altitude of 73 feet at the Ottawa River at the eastern edge of the Province to a height of 480 feet near the Hamlet of Algonquin in the head waters of the South Nation River. The observation wells (78) are listed by county. Well descriptions and water-level measurements are given. (Woodard-USGS)
W71-07295

GROUNDWATER OF SOUTHEASTERN VIRGINIA.
Virginia Dept. of Conservation and Economic Development, Charlottesville. Water Resources Div.

Virginia Division Water Resources Planning Bulletin, 262, 1970. 54 p, 25 plates, 2 tab, 37 ref.

Descriptors: *Water resources development, *Virginia, Groundwater, Water yield, Aquifers, Recharge, Water management (Applied), Planning, Water levels, Water table, Withdrawal.
Identifiers: Southeastern Virginia.

Groundwater in southeastern Virginia is obtained from both water table and artesian aquifers. The deep artesian system is the principal source of water. Pumpage has increased, principally in the Franklin area, from about one mgd in 1939 to about 46 mgd in 1969, and now is exceeding natural replenishment. Other cones of depression are developing. A continuing overdraft may result in serious groundwater supply difficulties in southeastern Virginia, and recommendations are offered to deal with the problem. (Knapp-USGS)
W71-07298

SELECTED HYDROLOGIC DATA, CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 07C.
W71-07303

EVALUATION OF THE QUANTITY AND QUALITY OF THE WATER RESOURCES OF VOLUSIA COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W71-07599

DERIVATION OF BASE FLOW RECESSION CURVES AND PARAMETERS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02E.
W71-07623

EFFECT OF SOIL MOISTURE HYSTERESIS ON THE WATER TABLE PROFILE AROUND A GRAVITY WELL,
Nevada Univ., Reno. Plant, Soil, and Water Science Div. and California Univ., Davis. Dept. of Water Science and Engineering.
J. C. Guitjens, and James N. Luthin.
Water Resources Research, Vol 7, No 2, p 334-346, Apr 1971. 13 p, 8 fig, 2 tab, 21 ref, 3 append.

Descriptors: *Hysteresis, *Soil water movement, *Drawdown, *Water table, *Water level fluctuations, Withdrawal, Surface-groundwater relationships, Infiltration, Seepage, Recharge, Soil moisture, Specific capacity, Time lag, Aquifer characteristics, Groundwater movement.
Identifiers: *Soil moisture-groundwater relations, *Gravity wells.

Gravity wells, pumped intermittently, can have different degrees of drainage in the unsaturated zone at the onset of water table recovery. Each part of the aquifer profile follows a specific curve of rewetting. Measured hysteresis of fine sand and hydraulic conductivity as a function of moisture content are incorporated in the partial differential equations for steady and unsteady radial flow to solve for the soil moisture pressure distribution of water table drawdown and three different kinds of recovery. The method of independent domain describes hysteresis and accounts for a gradual release and uptake of water rather than constant changes based on the concept of specific yield. Small differences between the computed values of the three water table recoveries, each one starting at a different degree of drainage in the zone above the water table, are probably due to the relatively small unsaturated portion of the aquifer profile. (Knapp-USGS)
W71-07626

THREE-DIMENSIONAL, TRANSIENT, SATURATED-UNSATURATED FLOW IN A GROUNDWATER BASIN,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
R. Allan Freeze.
Water Resources Research, Vol 7, No 2, p 347-366, Apr 1971. 20 p, 11 fig, 34 ref.

Descriptors: *Groundwater basins, *Hydrogeology, *Mathematical models, *Simulation analysis, *Numerical analysis, Groundwater movement, *Aquifers, Surface-groundwater relationships, Saturated flow, Rainfall-runoff relationships, Water yield, Safe yield, Computer programs, Water levels, Hydraulic gradient, Unsteady flow, Base flow, Water balance.
Identifiers: Transient flow.

A three-dimensional finite difference model was developed for the treatment of saturated-unsaturated transient flow in small nonhomogeneous, anisotropic geologic basins. The model includes the unsaturated zone in a basin-wide model that can also handle both confined and unconfined saturated aquifers, under both natural and developed conditions. The integrated equation of flow is solved by the line successive overrelaxation technique. The model allows any generalized region shape and any configuration of time variant boundary conditions. When applied to natural flow systems, the model provides quantitative hydrographs of surface infiltration, groundwater recharge, water table depth, and base flow. Results of simulations for hypothetical basins provide insight into the mechanisms involved in the development of perched water tables. The unsaturated basin response is the controlling factor in determining the nature of the base flow hydrograph. Application of the model to developed basins allows simulation of the manner in which groundwater withdrawals are transmitted through the aquifers, and the changes in the rates of groundwater recharge and discharge induced by the withdrawals. For any proposed pumping pattern, it is possible to predict the maximum basin yield that can be sustained by a flow system in equilibrium with the recharge-discharge characteristics of the basin. (Knapp-USGS)
W71-07627

QUASILINEARIZATION AND THE IDENTIFICATION OF AQUIFER PARAMETERS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 06A.
W71-07628

ONE-DIMENSIONAL GRAVITY DRAINAGE OF UNIFORM COLUMNS OF POROUS MATERIALS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02G.
W71-07629

GROUNDWATER CONDITIONS IN SOUTHERN UTAH VALLEY AND GOSHEN VALLEY, UTAH,
Geological Survey, Salt Lake City, Utah.
M. M. Cordova.
Copies of report available at Utah Dept of Natural Resources, Division of Water Rights, 442 State Capitol, Salt Lake City, Utah. Utah Department of Natural Resources Technical Publication No 28, 1970. 79 p, 29 fig, 4 plate, 14 tab, 20 ref.

Descriptors: *Groundwater, *Aquifers, *Water sources, *Groundwater recharge, *Utah, Wells, Artesian wells, Water balance, Irrigation, Water level fluctuations, Evapotranspiration, Seepage, Sewage disposal, Subsurface flow, Water resources development, Groundwater basins.
Identifiers: Groundwater temperature, Chemical quality, Central Utah Project, Utah Valley, Goshen Valley (Utah).

The valley fill in southern Utah Valley and Goshen Valley includes four main aquifers--a water-table aquifer and three artesian aquifers. The minimum estimate of recharge in 1966 was 150,000 acre-ft. The minimum estimate of discharge in 1966 was 220,000 acre-feet of which about 29,000 acre-ft was withdrawn from storage in the aquifer. Important factors that should be considered in managing the groundwater reservoir include increased withdrawal of water from wells, wastage of water from flowing wells, saltcedar infestation, sewage disposal, and the Central Utah Project. A quantitative evaluation of the actual effects of operating the Central Utah Project can be made only by a comprehensive water-resources study of the entire Utah Lake Valley. (Josefson-USGS)
W71-07637

HEAT REGIME CHARACTERISTICS OF RIVERS IN THE DANUBE AND DNIESTER BASINS (NEKOTORYYE OSOBENNOSTI TERMICHESKOGO REZHIM REK V BASSEYNAKH DUNAYA I DNESTRA),
For primary bibliographic entry see Field 02E.
W71-07655

THE SAN FERNANDO, CALIFORNIA, EARTHQUAKE OF FEBRUARY 9, 1971.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07659

WATER RESOURCES ASPECTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07661

2G. Water in Soils

ROOT ELONGATION RATES OF COTTON AND PEANUTS AS A FUNCTION OF SOIL STRENGTH AND SOIL WATER CONTENT,
Alabama Agricultural Experiment Station, Auburn.
H. M. Taylor, and Larry F. Ratliff.
Soil Science, 1969, Vol 108, No 2, p 113-119. 8 fig, 2 tab, 6 ref.

Descriptors: *Cotton, *Peanuts, *Soil strength, *Moisture content, *Root development, Resistance, Soil moisture, Soil-water-plant relationships, Plant growth, Root distribution.
Identifiers: *Soil-water potential, Penetrometer, Soil suction, Matric suction.

This research investigates the soil water content and soil matric suction effects on root elongation rates. Cotton and peanut root elongation rates decreased as soil strengths increased. Soil strengths were measured with a penetrometer. The relation between elongation rate and penetrometer resistance was not affected by 0.17 to 7.0 bars soil suction for cotton and 0.19 to 12.5 bars for peanuts. Root diameter increased with soil water content, particularly at low soil strengths. Figures and tables relate penetrometer resistance, root length, soil moisture, and time for cotton and peanut roots. (Popkin-Arizona)
W71-07157

IRRIGATION RESEARCH PROGRESS REPORT 1970, OKLAHOMA IRRIGATION RESEARCH STATION, ALTUS, OKLAHOMA.
Oklahoma Irrigation Experiment Station, Altus.
For primary bibliographic entry see Field 03F.
W71-07158

WATER DYNAMICS IN CLAYS BY NEUTRON SPECTROSCOPY,
Sydney Univ. (Australia). Dept. of Physical Chemistry.
R. J. Hunter, G. C. Stirling, and J. W. White.
Nature Physical Science, Vol 230, No 17, p 192-194, Apr 26, 1971. 3 p, 2 fig, 11 ref.

Descriptors: *Groundwater movement, *Clays, *Water chemistry, *Neutron activation analysis, *Spectroscopy, Soils, Soil dynamics, Analytical techniques, Soil water movement.

The behavior of water near solid surfaces is of current interest and, in particular, much attention has been paid to the water-clay interaction in layered alumino silicates. Experimental results show that neutron spectroscopy can be a valuable method for elucidating the behavior of water molecules very close to solid surfaces, with layered silicate structures providing a particularly useful model system in which the thicknesses and other properties of the water films can be precisely controlled. (Woodard-USGS)
W71-07264

SOIL STRUCTURE AND HYDRAULIC CONDUCTIVITY OF ADJACENT VIRGIN AND CULTIVATED PEDONS AT TWO SITES: A TYPIC ARGIUDOLL (SILT LOAM) AND A TYPIC EUTROCHREPT (CLAY),
Wisconsin Univ., Madison. Geological and National History Survey; and Wisconsin Univ., Madison. Dept. of Soil Science.
J. Bouma, and F. D. Hole.
Soil Science Society of America Proceedings, Vol 35, No 2, p 316-319, Mar-Apr 1971. 4 p, 1 fig, 1 tab, 15 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, *Soil structure, *Soil management, Cultivation, Cultivated lands, Soil physics, Soil horizons, Soil types.

Soil morphology and hydraulic conductivity (K) of principal soil horizons of paired virgin and cultivated soil pedons were studied at two sites: a Tama silt loam (Typic Argiudoll) and an Oshkosh clay (Typic Eutrochrept). About a century of cultivation had led to reduction of K (measured by the Bouwer double-tube method) in the upper part of the solum below the Ap. Corresponding changes in soil morphology are noted. The reductions in K are paralleled by increases in bulk density and decreases in porosity and organic matter content in the soil horizons. At a depth of 80 to 90 cm in the clay soil, K increased apparently as a result of formation of interpedal voids as the alfalfa crop (Medicago sativa L.) extracted moisture. (Knapp-USGS)
W71-07274

PHYSICO-CHEMICAL PROPERTIES OF SOLS AND GELS OF Na-MONTMORILLONITE WITH AND WITHOUT ADSORBED HYDROUS ALUMINUM OXIDE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
Brian G. Davey, and Philip F. Low.
Soil Science Society of America Proceedings, Vol 35, No 2, p 230-236, Mar-Apr 1971. 7 p, 7 fig, 31 ref.

Descriptors: *Gels, *Montmorillonite, *Water chemistry, *Adsorption, Clay minerals, Ion exchange, Soil chemical properties, Mineralogy, Soil strength.
Identifiers: Sols.

Sodium-montmorillonite was prepared with and without adsorbed hydrous aluminum oxide. The two clays were mixed with NaCl solution in different proportions. The clay content at which gelation began, as indicated by an increase in viscosity and the initiation of non-Newtonian and hysteretic behavior, was lower for the Na/Al-clay than for the Na-clay. Theoretical considerations indicated that both strong and weak bonds were present in the sols. Specific heat capacities were found to differ from those calculated from the known proportions and specific heat capacites of clay and water. Differences were greater for the Na/Al- than for the Na-clay. These differences could be attributed to clay-water interaction. The relative partial molar free energy of NaCl changed with clay content in somewhat different ways for the Na/Al- and Na-clay mixtures. Adsorbed hydrous aluminum oxide influence the physico-chemical properties of sols and gels of Na-montmorillonite. (Knapp-USGS)
W71-07275

MEASURING SOIL MATRIC POTENTIAL IN SITU BY SENSING HEAT DISSIPATION WITHIN A PROUS BODY: II. EXPERIMENTAL RESULTS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
C. J. Phene, S. L. Rawlins, and G. J. Hoffman.
Soil Science Society of America Proceedings, Vol 35, No 2, p 225-229, Mar-Apr 1971. 5 p, 4 fig, 8 ref.

Descriptors: *Soil moisture meters, *Heat transfer, *Moisture tension, Pore pressure, Soil water, Soil moisture, Instrumentation, Telemetry.
Identifiers: *Matric potential, *Psychrometers.

A sensor designed to measure the matric potential of soil water in situ was tested in soil-plant systems. In the field, temperatures obtained by the sensor were used to predict optimum time for measurement to avoid error caused by diurnal temperature drift in the soil. The error caused by temperature drift was eliminated completely by using two matched diode sensors and taking a temperature difference measurement. The accuracy of the matric potential sensor proved to be as good as or better than that of other techniques used to measure matric potential. Sensors with high sensitivity in the 0 to -2 bar matric potential range had an accuracy of 0.2 bar. The accuracy decreased progressively to 1 bar at a matric potential of -10 bars. (Knapp-USGS)
W71-07276

SOIL-WATER HYSTERESIS: THE DOMAIN THEORY EXTENDED TO PORE INTERACTION CONDITIONS,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
G. C. Topp.
Soil Science Society of America Proceedings, Vol 35, No 2, p 219-225, Mar-Apr 1971. 7 p, 10 fig, 13 ref.

Descriptors: *Wetting, *Soil water movement, *Hysteresis, Porous media, Infiltration, Percolation.
Identifiers: Independent domain theory.

Some inadequacies of the independent domain theory of hysteresis were overcome by modifying an extension to the theory to include two types of pore interactions. In the independent domain theory only the shapes of the pores determined the draining and filling characteristics of each pore. In this extension to the theory, the draining and filling of each pore depends on the state of neighboring pores as well as the pore geometry. The ratios of changes in water content of the soil during drying and rewetting over a given pressure head range were used to determine the importance of pore interactions and to separate the two types of pore blockage. Primary scanning curve data for porous materials ranging from glass beads to clay loam soil showed that pore blockage against air-entry during drying of a soil near saturation and pore blockage against water-entry during rewetting of a relatively dry soil were the two major types of pore interactions. The degree of pore blockage appeared to be dependent only on the water content of the soil. (Knapp-USGS)
W71-07277

MEASUREMENT OF ATTENUATION OF Cs-137 AND Am-241 GAMMA RAYS FOR SOIL DENSITY AND WATER CONTENT DETERMINATIONS,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
J. C. Corey, S. F. Peterson, and M. A. Wakat.
Soil Science Society of America Proceedings, Vol 35, No 2, p 215-219, Mar-Apr 1971. 5 p, 4 fig, 3 tab, 9 ref.

Descriptors: *Nuclear moisture meters, *Gamma rays, *Expensive soils, Soil water movement, Soil density, Soil moisture meters, Instrumentation, Calibrations.
Identifiers: *Nuclear soil density meters.

A 400-channel pulse-height analyzer was shown to be adequate for determining the attenuation of a collimated gamma beam from a combined Am-241 and Cs-137 source. The method can be used to calculate the water content and soil density of either swelling or nonswelling soils. Soil density and water content can be determined concurrently by measuring the attenuation of two different gamma energies. With the multichannel pulse-height analyzer, it was simpler to adjust the area under the americium peak for the Compton contribution from the cesium radiation than with a single channel pulse-height analyzer. (Knapp-USGS)
W71-07278

THE DIFFUSION AND CONSUMPTION OF OXYGEN IN SUBMERGED SOILS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
R. H. Howeler, and D. R. Bouldin.
Soil Science Society of America Proceedings, Vol 35, No 2, p 202-208, Mar-Apr 1971. 7 p, 5 fig, 6 tab, 14 ref.

Descriptors: *Oxygen demand, *Aquatic soils, *Bottom sediments, Oxidation, Iron, Chemical oxygen demand, Oxygen, Aeration, Dissolved oxygen, Soil gases.
Identifiers: Submerged soils.

Six oxygen diffusion models were evaluated by measuring consumption rates under conditions which approached the steady state and under transient-state conditions. Consumption rates under approximately steady-state conditions were determined by placing undisturbed lake-bottom cores in water and measuring the decrease in oxygen concentration of the water. Transient-state consumption rates were determined from the amount of oxygen gas that had to be injected above an initially reduced soil to maintain a constant concentration at the soil surface. The distribution of extractable Fe in the cores was obtained by sectioning frozen soil cores and extracting the sections with NaOAc at pH 2.8 and with dithionite in EDTA. Considerable amounts of Fe (..2) WERE FOUND TO DIFFUSE FROM THE REDUCED ZONE TO THE OXIDIZED ZONE WHERE IT ACCUMULATED AS PRECIPITATED Fe (..3). The oxygen consumption was best described by models which included consumption by microbial respiration in the aerobic zone and oxidation of mobile and nonmobile reductants such as Fe (..2). (Knapp-USGS)
W71-07280

T1-208 AND Na-24 GAMMA SOURCES FOR IDENTIFYING SOIL WATER TAGGED WITH DEUTERIUM,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
R. H. Hawkins, R. F. Overman, and J. C. Corey.
Soil Science Society of America Proceedings, Vol 25, No 2, p 199-201, Mar-Apr 1971. 3 p, 2 fig, 8 ref. USAEC Contract AT (07-2)-1.

Descriptors: *Tracers, *Radioisotopes, *Soil water movement, Deuterium, Tracking techniques, Stable isotopes.
Identifiers: *Soil water tracers.

In situ tracing of soil water movement with the D2O Na-24 method is limited by the need to reactivate the Na-24 gamma source frequently (half-life of 15 hours) in a nuclear reactor. T1-208 produced the same neutron count rates from vials of D2O in dry and moist soils as did Na-24. The 1.9-year effective half-life of T1-208 in equilibrium with its parent nuclide Th-228 is a significant advantage over Na-24. Recent commercial availability of T1-208 sources now makes in situ D2O tracing of soil water feasible for investigators not having access to a nuclear reactor. (Knapp-USGS)
W71-07281

ECONOMIC IRRIGABILITY OF THE SOILS OF ROOSEVELT COUNTY, NEW MEXICO, 1967,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W71-07506

MICROBIAL DEGRADATION OF THE HERBICIDE ATRAZINE AND ITS 2-HYDROXY ANALOG IN SUBMERGED SOILS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 05B.
W71-07619

EFFECT OF SOIL MOISTURE HYSTERESIS ON THE WATER TABLE PROFILE AROUND A GRAVITY WELL,
Nevada Univ., Reno. Plant, Soil, and Water Science Div. and California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02F.
W71-07626

ONE-DIMENSIONAL GRAVITY DRAINAGE OF UNIFORM COLUMNS OF POROUS MATERIALS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
F. D. Whisler, and K. K. Watson.
Journal of Hydrology, Vol 6, No 3, p 277-296, 1968. 20 p, 14 fig, 12 ref.

Descriptors: *Soil water movement, *Infiltration, *Percolation, *Porous media, *Numerical analysis, Computer programs, Equations, Soils, Gravity, Hydraulic conductivity, Pressure head, Hydrology, Permeability, Recharge, Drainage, Withdrawal, Groundwater movement, Artificial recharge, Water spreading, Saturated flow, Water table.

A numerical analysis of the one-dimensional gravity drainage problem uses the pressure head form of the differential equation of flow. The analysis is programmed for solution by a digital computer and was tested against several sets of published experimental data with known hydrologic characteristics of porous material, and time profiles of pressure head and water content. The numerical approach was then used to investigate physical aspects of the drainage process. Problems involving intermittent inundation sequences were applied to deep sand profiles in groundwater recharge operations. The drainage of the saturated profile constitutes the first and simplest phase of an increasingly complex situation as the watering schedules develop. (Woodard-USGS)
W71-07629

MEASURING THE HYDRAULIC POTENTIAL OF GROUNDWATER WITH THE HYDRAULIC POTENTIAL PROBE,
Grontmij N.V., Bilt (Netherlands).
For primary bibliographic entry see Field 07B.
W71-07630

2H. Lakes

CHARACTERISTICS OF NEW YORK LAKES: PART 1A--GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY COUNTIES,
Geological Survey, Albany, N.Y.
Phillip E. Greeson, and George E. Williams.
New York State Department of Environmental Conservation Bulletin 68A, 1970. 121 p, 1 fig, 1 tab.

Descriptors: *Lakes, *Ponds, *Reservoirs, *Documentation, *New York, Sites, Lake morphology, Hydrologic data, Surface waters, Surveys, Lake morphometry.
Identifiers: *New York lakes.

An alphabetical listing with physical descriptions of the lakes, ponds, and reservoirs of New York State was published as New York State Department of Environmental Conservation Bulletin 68. As an aid to water-resources managers, planners, and developers, the alphabetical entries are listed according to the 62 counties of New York State. Details and codes for the included parameters may be found in Bulletin 68. This supplemental Bulletin 68A accompanies supplemental Bulletin 68B which presents an arrangement of the lakes, ponds and reservoirs of New York State according to drainage basins. (See also W71-07186) (Woodard-USGS)
W71-07185

CHARACTERISTICS OF NEW YORK LAKES: PART 1B.-GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY DRAINAGE BASINS,
Geological Survey, Albany, N.Y.
Phillip E. Greeson, and George E. Williams.
New York State Department of Environmental Conservation Bulletin 68B, 1970. 122 p, 1 fig, 1 tab.

Descriptors: *Lakes, *Ponds, *Reservoirs, *Documentation, *New York, Sites, Lake morphology, Hydrologic data, Surface waters, Surveys, Lake morphometry.
Identifiers: *New York lakes.

An alphabetical listing with physical descriptions of the lakes, ponds, and reservoirs of New York State was published as New York State was published as New York State Department of Environmental Conservation Bulletin 68 by Greeson and Robison, 1970. As an aid to water-resources managers, planners, and developers, the alphabetical entries are listed according to the drainage basins of New York State. Details and codes for the included parameters may be found in Bulletin 68. This supplemental Bulletin 68B accompanies supplemental Bulletin 68A, which presents an arrangement of the lakes, ponds, and reservoirs of New York State according to counties. (See also W71-07185) (Woodard-USGS)
W71-07186

GAZETTEER OF LOUISIANA LAKES AND RESERVOIRS,
Geological Survey, Baton Rouge, La.
William J. Shampine.
Louisiana Department of Public Works Basic Records Report No 4, 1970. 31 p, 3 fig, 3 tab, 5 ref.

Descriptors: *Hydrologic data, *Lakes, *Reservoirs, *Louisiana, *Data collections, Surface waters, Lake morphology, Lake morphometry, Water resources development, Water utilization.
Identifiers: Basic-data compilation (Lakes).

There are more than 2,400 square miles of lake and reservoir surface area in Louisiana, which provide excellent opportunities for recreational, industrial, municipal, and agricultural usage. These lakes constitute a very significant part of the State's total water resources and are an integral part of the hydrology of many drainage basins. Physical data for all lakes and reservoirs having a surface area of 25 square mile or more are tabulated. Included are location, drainage area, elevation, surface area, volume, use, and outlet. Available basic data are listed. Lakes larger than 1 square mile are ranked in order of size. (Woodard-USGS)
W71-07247

A HYDROLOGIC MODEL OF THE LAKE ONTARIO LOCAL DRAINAGE BASIN,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
D. F. Witherspoon.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch, Technical Bulletin No 31, 1970. 12 p, 3 fig, 1 tab, 13 ref.

Descriptors: *Mathematical models, *Lake Ontario, *Hydrology, *Water balance, Precipitation (Atmospheric), Evaporation, Albedo, Temperature, Wind, Humidity, Runoff, Surface-groundwater relationships, Mathematical studies, Inflow, Discharge (Water), Evaluation, Routing.
Identifiers: Hydrologic models.

A mathematical model based on the water and energy balances is proposed for the Lake Ontario local drainage basin (27,100 square miles, comprising the entire local contributing area except for the lake's water surface area of 7,500 square miles). Using a hypothesis which provides estimates of the annual regional evaporation, regional moisture values are obtained which, when routed, simulate the measured monthly outflows from the land area. The model provides a means for studying the hydrology of the basin, simulation of long periods of record and basic relationships which can be used in developing forecasting techniques. Two analyses were performed to determine whether the model provided a good representation of the outflow from the local contributing area to the lake. In the first, the cumulative measured outflow was plotted on a time base with the cumulative computed outflow. Good agreement was achieved. The annual values of measured and computed outflow were plotted on the basis of a September through August water year. This water year was chosen with reference to the measured outflows which consistently showed that the lowest flows occur in August. As a result of a correlation of the annual values, the correlation coefficient was 0.92, with a standard error of 0.03. (Woodard-USGS)
W71-07250

DISTRIBUTION OF MERCURY IN UNCONSOLIDATED SEDIMENTS FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 05B.
W71-07286

CHARACTERISTICS OF NEW YORK LAKES: PART 1 - GAZETTEER OF LAKES, PONDS, AND RESERVOIRS,
Geological Survey, Albany, N. Y.
Phillip E. Greeson, and F. Luman Robison.
New York State Department of Environmental Conservation Bulletin 68, 1970. 124 p, 2 fig, 1 plate, 5 tab, 3 ref.

Descriptors: *Lakes, *Ponds, *Reservoirs, *Documentation, *New York, Surface waters, Sites, Hydrologic data, Lake morphology, Surveys, Lake morphometry.
Identifiers: *New York lakes, Lake characteristics.

New York State has more than 4,000 lakes, ponds, and reservoirs. The gazetteer is an alphabetical listing of all lakes in the State having a surface area greater than 0.01 square mile and includes the following characteristics of each lake: name, county, number of counties in which the lake is located, quadrangle, number of quadrangles on which the lake is located, major and minor drainage basins, latitude, longitude surface elevation, drainage area, surface area, length of shoreline and volume. Over 800 unnamed ponds are included in the gazetteer. An alphabetical list is given of the topographic quadrangles coded to an index map showing location of the various topographic maps and the major surface water features. The lakes constitute a very significant part of the State's total water resources and are an integral part of the hydrology of the drainage basins. (See also W71-07185 and W71-07186) (Woodard-USGS).
W71-07297

DYNAMICS OF NUTRIENT CONCENTRATIONS IN THE ILLINOIS RIVER,
Illinois State Water Survey, Peoria. Water Quality Section.
Wun-Cheng Wang, and Ralph L. Evans.
Journal Water Pollution Control Federation, Vol 42, No 12, p 2117-2123, Dec 1970. 6 fig, 2 tab, 14 ref.

Descriptors: *Nitrates, *Phosphates, *Path of pollutants, *Surface runoff, Water temperature, Hydrogen ion concentration, Turbidity, Illinois, Dissolved oxygen, Alkalinity, Hardness (Water), Iron, Fluorides, Silica, Ammonia, Organic compounds, Nitrogen, Statistical methods, Flow rates.
Identifiers: *Peoria Lake (Illinois), Orthophosphates, Polyphosphates.

The dynamics of the concentration of certain minerals in a sector of the Illinois River were investigated. Use was made of the background concentration of fluoride in the stream as a reference source for defining the effect of stream flow on the mineral concentrations. Fluoride and orthophosphate-P concentrations decreased as stream flow increased. The ratio of orthophosphate-P to fluoride remained reasonably constant regardless of flow. The ratios of nitrate-N fluoride and organic-N fluoride increased as stream flow increased. The concentration-flow patterns strongly support the contention that a major source of nitrogen to the study area is derived from surface runoff whereas phosphorus from the same source is minimal. (Little-Battelle)
W71-07407

ANNUAL TEMPERATURE VARIATIONS IN AN IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria.
V. Kothandaraman, and Ralph L. Evans.
Journal American Water Works Association, Vol 62, No 10, p 639-642, Oct 1970. 5 fig, 3 tab, 9 ref.

Descriptors: *Thermal stratification, *Computer models, *Temperature, Epilimnion, Lakes, Model studies, Impoundments.
Identifiers: *Lake Bloomington, *Temperature prediction model, Harmonic temperature gradient.

A harmonic equation is found to be an excellent representation of the annual temperature variations at all depths in a lake. A computer program is developed to evaluate the components of the harmonic using a continuous and equally spaced temperature record covering a period of at least one year. Summer stratification in the lake under study appears to persist from June to September. At sections of the lake with depths greater than 20 ft., all the three characteristic zones of summer stratification were observed. On the other hand, at sections with depths less than 20 ft., there was either no stratification, or the stratification consisted of a small but regular temperature gradient of about 5 to 15F from top to bottom. It would appear that the limiting depth of the epilimnitic zone in Lake Bloomington, as defined by temperature, is about 20 ft. (Oleszkiewicz-Vanderbilt)
W71-07443

DESTRATIFICATION EXPERIMENTS AT ROTTERDAM,
P. L. Knoppert, J. J. Rook, Tj. Hofker, and G. Oskam.
Journal American Water Works Association, Vol 62, No 7, p 448-454, July 1970. 11 fig, 2 tab, 13 ref.

Descriptors: *Thermal stratification, *Temperature, *Aeration, *Water quality, Thermocline, Mixing, Algae, Lakes.
Identifiers: *Artificial destratification, *Lake Maarsseveen, Zeeuws-Vlaanderen Reservoirs.

The experiments of Lake Maarsseveen showed that using compressed air as a method of artificial destratification permits the maintenance of a sharp thermocline at a chosen level. Also, these experiments showed that during artificial destratification, the thermocline sank to the same level over the entire lake, at any given time. Comparison of two techniques, for injecting air, an air bubble screen across the lake, and a single diffusor at one point, showed that the air bubble screen gave better results. From the Zeeuws-Vlaanderen experiment the tentative conclusion may be drawn that the depth of the lake in relation to optical characteristics of the water is an important parameter for the algal behavior of an impoundment, if the thermal conditions are modified artificially. (Oleszkiewicz-Vanderbilt)
W71-07447

THE EFFECTS OF URBAN DRAINAGE ON LAKE McILWAINE, RHODESIA,
For primary bibliographic entry see Field 05C.
W71-07524

PROCEEDINGS, GREAT LAKES WATER RESOURCES CONFERENCE.
For primary bibliographic entry see Field 06B.

W71-07565

HISTORY OF THE DEVELOPMENT OF USE OF THE GREAT LAKES AND PRESENT PROBLEMS,
Army Engineer Div., Chicago, Ill.
For primary bibliographic entry see Field 06B.
W71-07567

WATER CONFLICTS ON LAKE ERIE,
Pennsylvania Dept. of Health, Harrisburg, Pa.
For primary bibliographic entry see Field 05C.
W71-07569

CONFLICTS ARISING FROM THE USE OF SHORE PROPERTY ON THE GREAT LAKES,
Department of Public Works, Toronto (Ontario).
For primary bibliographic entry see Field 04C.
W71-07571

REGULATION OF GREAT LAKES LEVELS AND FLOWS,
United States Lake Survey, Detroit, Mich.
B. G. DeCooke.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 249-275, 1968.

Descriptors: *Cost-benefit analysis, *Lakes, *Statistics, *Economic evaluation, *Great Lakes, *Water supply, Precipitation, Runoff, Groundwater, Evaporation, Canals, Navigation, Time, Flooding, Erosion.
Identifiers: *Lake regulation, *Rule-and-limitation, *Stochastic approach, Regulation plans, Shore property.

A survey is made of the physical characteristics, hydraulics, and hydrology of the Great Lakes system, touching on such items as average lake levels, outflows, runoff, precipitation and evaporation. Both the rule and limitation approach and the stochastic approach to regulation plan development of water supplies are presented and compared. Specific plan examples are given for Lakes Superior and Ontario. The difficulties in regulation are discussed, including the natural hydrologic factors of precipitation, runoff, groundwater, and evaporation and the time lag difficulty in water supply. The interests of shore property, navigation, and power in the levels and outflows of the Great Lakes are also compared in terms of cost-benefit analysis to provide the economic justification for plan regulation. The basic objective of such regulation is the achievement of a regimen of lake levels and outflows giving consideration to both the beneficial and adverse effects on all the interests involved. (See also W71-07565) (Murphy-Rutgers)
W71-07572

STUDIES AND RESEARCH NEEDED IN REGULATION OF THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Department of Energy, Mines and Resources, Ottawa (Ontario).
A. M. Becton, and H. B. Rosenberg.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 311-342, 1968.

Descriptors: *Great Lakes, *Water supply, *Water resource development, *Water quality, Reservoir, Dams, Water levels, Recreation, Environment, Population, Waste disposal, Navigation, Optimization.
Identifiers: *Multi-disciplinary activity, Shore property.

The need is indicated for multi-disciplinary study and research to solve Great Lakes problems due to increasing population pressures and increasing demands on the resource from various interests. Some suggested areas for this approach are engineering, economics, biology, sociology, and law. These are justified by the close relationship between water problems and socioeconomic problems as seen in the areas of shore property, hydro-power, recreation, water supply, navigation, waste disposal, and water diversions. Future studies should encompass hydrologic trends from environmental changes to optimize water resource development. Research is needed to determine the effect of changes in water levels on plant, animal and human life. This would provide a means for realizing benefits from engineering works on the lakes that will serve to enhance water quality, recreational use, and fish and wildlife habitat. (See also W71-07565) (Murphy-Rutgers)
W71-07573

NEW REQUIREMENTS IN WATER RESOURCES PLANNING ON THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06B.
W71-07574

WATER QUALITY CONTROL PRACTICES ON THE GREAT LAKES,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05G.
W71-07575

FLOATING VEGETATION OF LAKE KAINJI, NIGERIA,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
For primary bibliographic entry see Field 04A.
W71-07602

BOSMINA STRATIGRAPHY OF LAKE SEDIMENTS (FINNISH: JARVIKERROSTUMIEN BOSMINA-STRATIGRAFIASTA),
Pentti Alhonen.
Geologi (Finland), Vol 23, No 2, p 26-31, 1971. 6 p, 5 fig, 19 ref.

Descriptors: *Waterfleas, *Lakes, *Lake soils, *Sediment-water interfaces, Lake morphometry, Lake stages, Sediments, Plankton, Stratigraphy, Organic matter, Dystrophy, Crustaceans, Paleolimnology.
Identifiers: *Finland, *Lake sediments, Biostratigraphy, Ignition loss, Carbon-nitrogen ratio.

The stratigraphic distribution of Bosmina, a prevalent waterflea species of subfossil fauna of lake sediments, is examined for four northern Finnish lakes -- the Telkko, Sarkijarvi, Jarvenkylanjarvi and the Leppasjarvi. The four lakes of similar age are compared on the basis of Bosmina remains, calculated for one cubic centimeter of fresh sediment, ignition loss and the carbon/nitrogen ratio. Studies show that there is a marked increase in Bosmina production in the early stages of lake development but that a decrease in the stratigraphic fluctuation of the maxima is observed at later periods. It is suggested that Bosmina production is determined to a significant extent by morphometric and bathymetric changes in the lakes, since nutrient conditions along do not account for the Bosmina curve. Bosmina production may further be enhanced by the dystrophic process of lakes, as indicated by recent investigations in southwest Finland. (Josefson-USGS)
W71-07620

HYDROLOGIC SETTING OF DEER POINT LAKE NEAR PANAMA CITY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W71-07639

USE OF THE 'PROMIN' COMPUTER FOR CALCULATING THE EFFECT OF A RIVER BASIN RESERVOIR ON MAXIMUM WATER DISCHARGES (RUSSIAN: OPYT PRIMENENIYA EVM 'PROMIN DLYA RASCHETA VLIYANIYA VODOKHRANILISHCHA V BASSEYNE REKI NA MAKSIMAL 'NYYE RASKHODY VODY),
For primary bibliographic entry see Field 02E.
W71-07648

PREDICTION OF VERTICAL PROFILES OF WIND SPEED OVER A LAKE,
Department of Energy, Mines and Resources, Burlington (Ontario). Centre for Inland Waters.
H. S. Weiler.
Proceedings of the Twelfth Conference on Great Lakes Research, Michigan University, Ann Arbor, Michigan, p 492-503, May 5-7, 1969. 4 fig, 3 tab, 27 ref.

Descriptors: *Winds, *Wind velocity, Air temperature, Height, Water temperature, *Lakes, Forecasting, *Lake Ontario, Great Lakes.
Identifiers: Vertical wind profile, Monin-Obukhov wind profile.

A large number of vertical profiles of mean wind speed above the lake surface were collected at a site in Lake Ontario in 1967. Two schemes for predicting the vertical profile of mean wind speed over a lake from measured values of air temperature and wind speed at one height, as well as the surface water temperature, were tried. A total of 787 wind speed profiles were analyzed, and showed that there was no significant difference in the ability of either the engineering formula approach used by meteorologists over land, or the modified Monin-Obukhov log plus linear wind profile approach, to predict the vertical profile within a standard deviation of 3.6 percent at the worst. It is concluded that for general computational purposes, the simpler of the two schemes, the engineering formula approach, would be preferable. (Upadhyaya-Vanderbilt)
W71-07666

EXISTING AND POTENTIAL PROBLEMS OF EXCESSIVE EUTROPHICATION IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Chattanooga. Water Quality Branch.
For primary bibliographic entry see Field 05C.
W71-07698

2I. Water in Plants

GROWTH AND PERFORMANCE OF COTTON IN A DESERT ENVIRONMENT: I. MORPHOLOGICAL DEVELOPMENT OF THE CROP; II. DRY MATTER PRODUCTION; III. CROP PERFORMANCE,
Cotton Research Corp., Namulonge (Uganda). Cotton Research Station.
For primary bibliographic entry see Field 03F.
W71-07154

THE PRODUCTIVITY OF ZONAL TERRESTRIAL PLANT COMMUNITIES AND THE MOISTURE AND HEAT PARAMETERS OF AREA,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02D.
W71-07155

EFFECT OF ENVIRONMENTAL FACTORS ON CUTICULAR TRANSPIRATION RESISTANCE,
National and Univ. Inst. of Agriculture, Rehovot (Israel). Volcani Inst. of Agricultural Research.
For primary bibliographic entry see Field 02D.
W71-07156

ROOT ELONGATION RATES OF COTTON AND PEANUTS AS A FUNCTION OF SOIL STRENGTH AND SOIL WATER CONTENT,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 02G.

W71-07157

IRRIGATION RESEARCH PROGRESS REPORT 1970, OKLAHOMA IRRIGATION RESEARCH STATION, ALTUS, OKLAHOMA.
Oklahoma Irrigation Experiment Station, Altus.
For primary bibliographic entry see Field 03F.
W71-07158

WATER STRESS AND APICAL DOMINANCE IN PISUM SATIVUM,
Regina Research Station (Saskatchewan).
G. I. McIntyre.
Nature New Biology, Vol 230, No 11, p 87-88, Mar 17, 1971. 2 p, 1 fig, 3 tab, 7 ref.

Descriptors: *Soil water-plant relationships, *Beans, *Transpiration, Testing, Test procedures, Plants, Plant growth, Plant physiology, Nitrogen, Carbohydrates.
Identifiers: *Water stress, *Apical dominance, Pisum sativum.

A recent study of apical dominance in isolated rhizomes of Agropyron repens L. Beauv. suggested that inhibition of the lateral buds by the rhizome apex largely depends on the supply of water, nitrogen and carbohydrate, any of which could act as a limiting factor and thus determine the degree of inhibition. To test this hypothesis, experiments were conducted with peas (Pisum sativum, variety 'Alaska'), which exhibit strong apical dominance and which are widely used in the study of this phenomenon. The results agreed with the concept of limiting nutritional factors, and suggest that for this species water stress may be particularly significant. (Woodard-USGS)
W71-07283

2J. Erosion and Sedimentation

EROSION RATES IN THE STEVEVILLE BADLANDS, ALBERTA,
Alberta Univ., Edmonton.
Ian A. Campbell.
Canadian Geographer, Vol 14, No 3, p 202-216, 1970. 7 fig, 7 tab, 26 ref.

Descriptors: *Soil erosion, *Sediment yield, *Precipitation (Atmospheric), *Geomorphology, Runoff, On-site data collections, Geology, Landforms, Semiarid climates, Seasonal, Particle size, Microenvironment, Slopes, Regression analysis, Correlation analysis.
Identifiers: *Alberta (Canada).

Geomorphological investigations of badlands have a number of advantages: (1) The areas are nearly totally devoid of vegetation and therefore lacking an unconsolidated but impermeable parent material which normally facilitates the quick development of erosional and depositional forms under rapid runoff conditions (2) The number of landform generating variables is minimal (3) since many formation or destruction processes are small scale, they may be observed and measured in detail. Nine 1 square yard runoff plots, encompassing a variety of microenvironmental conditions, were randomly selected in a number of relatively undisturbed rilled slopes. Each plot was supplied with a 6-inch rain gauge and 6 sediment yield collections were taken from July - October. Sample yields were weighed and wet-sieved for particle size determination. Weights were tabulated against precipitation amounts causing their production and particle size distributions were compared to lithological distributions. No relationship was found between the 2 sets of particle size distribution. There was an overall relationship between rainfall amount and sediment yield but linear regression analysis for each rainfall period showed no correlation between these amounts for any period. It was therefore necessary to individually analyze each plot's rainfall and sediment yields, and a strong correlation was then found. Annual sediment yield rates are likely to be underestimated because of drainage due to snowmelt. Moreover, downslope sediment yield occurs piecemeal. Results should be interpreted cautiously. (Casey-Arizona)
W71-07165

FATTY ACID DIAGENESIS IN RECENT SEDIMENT FROM NARRAGANSETT BAY, RHODE ISLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
John W. Farrington, and James G. Quinn.
Nature Physical Science, Vol 230, No 11, p 67-69, Mar 15, 1971. 3 p, 1 fig, 2 tab, 8 ref.

Descriptors: *Sedimentology, *Sediments, *Diagenesis, *Bays, *Organic acids, Core drilling, Sampling, Analytical techniques, Rhode Island, Texas.
Identifiers: *Narragansett Bay (RI), *Baffin Bay (Tex).

The total fatty acid concentrations in cores from recent sediments from Narragansett Bay, Rhode Island decreased rapidly from 0 to 8 cm to 16 to 33 cm and level off at 33 to 52 cm. This may be due to a diminution of bacterial and/or infaunal activity at the last of these depths of burial. The concentration of the unsaturated fatty acids relative to the saturated fatty acids decreases rapidly with depth. This can be attributed to any one or a combination of the following: (1) the greater stability of the saturated fatty acids relative to the unsaturated fatty acids; (2) the conversion of some of the unsaturated fatty acids to their saturated analogues; (3) preferential resynthesis of saturated fatty acids because of bacterial or infaunal activity. The fatty acid concentrations from samples collected at Narragansett Bay are compared with findings from a similar study made in Baffin Bay, Texas. (Woodard-USGS)
W71-07261

MARINE SHELL RADIOCARBON DATES AND THE CHRONOLOGY OF DEGLACIATION IN WESTERN SCOTLAND,
Institute of Geological Sciences, Edinburgh (Scotland).
J. D. Peacock.
Nature Physical Science, Vol 230, No 2, p 43-45, Mar 8, 1971. 3 p, 1 fig, 3 tab, 14 ref.

Descriptors: *Radioactive dating, *Clays, *Marine geology, *Carbon radioisotopes, *Sedimentation, Glaciation, Bentonite, Core drilling, Boreholes, Bottom sediments, Sampling, Pleistocene epoch.
Identifiers: *Scotland.

Richly fossiliferous marine clays of late-Glacial age have long been known from the Clyde area and from isolated localities as far north as Fort William, and radiocarbon dates have been published from such clays incorporated in terminal moraines of the Loch Lomond readvance. Dates for four additional localities determined at Stockholm on behalf of the Institute of Geological Sciences are presented. At South Shian at the seaward end of Loch Creran, the shells were obtained from glacially disturbed marine clay exposed below morainic sands near the ferry pier. The dates, which fall within the Allerod part of the Late Weichselian, compare with those from Drymen and Menteith and confirm that the glacial deposits belong to the Loch Lomond readvance. (Woodard-USGS)
W71-07262

INITIAL REPORTS OF THE DEEP SEA DRILLING PROJECT, VOL. 6--HONOLULU, HAWAII TO APRA, GUAM, JUNE-AUGUST, 1969.
Scripps Institution of Oceanography, La Jolla, Calif.

For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 Price - $15.50 (casebound). National Science Foundation Publication, Feb 1971: Washington, DC, US Government Printing Office. 1,329 p. NSF Contract C-482.

Descriptors: *Oceanography, *Core drilling, *Pacific Ocean, *Sediments, *Marine geology, Data collections, Sampling, Stratigraphy, Stratification, Sediment transport, Deposition (Sediments), Provenance, Petrography, Chemical properties, Physical properties, Water chemistry.
Identifiers: *Philippine Sea.

Four of the major oceanographic institutions that have strong interests in the fields of marine geology and geophysics formed the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) in May 1964. This group included Lamont-Doherty Geological Observatory; the Institute of Marine Sciences, University of Miami; THE Scripps Institution of Oceanography, University of California at San Diego; and the Woods Hole Oceanographic Institution. The membership of this original group was later enlarged in 1968 when the University of Washington became a member. The goal of the Deep Sea Drilling Project is to gather scientific information that will help determine the age and processes of development of the ocean basins. Cores recovered from deep beneath the ocean floor provide reference material for a multitude of future studies in fields such as biostratigraphy, physical stratigraphy, and paleomagnetism, that will afford a new scope for studies of the physical and chemical aspects of sediment provenance, transportation, deposition, and diagenesis. This volume contains data collected during a cruise from Honolulu, Hawaii, to Apra, Guam, June-August, 1969. (See also W71-07288 thru W71-07291) (Woodard-USGS)
W71-07287

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 6,
Geological Survey, Woods Hole, Mass.; and Woods Hole Oceanographic Institution, Mass.
F. T. Manheim, and F. L. Sayles.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 Price - $15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 811-821, February 1971: Washington, DC, US Government Printing Office. 11 p, 2 tab, 1 ref. NSF Contract C-482.

Descriptors: *Connate water, *Core drilling, *Sediments, *Water chemistry, *Pacific Ocean, Interstices, Marine geology, Porosity, Sampling, Water quality, Chemical analysis, Data collections, Analytical techniques, Water storage, Diagenesis.
Identifiers: *Interstitial water, Sediment waters, Philippine Sea.

Sediments from sites west of the Hawaiian Islands consisted primarily of variouscombinations of deep-sea biogenic oozes, volcanic ash, and its breakdown products. Pore fluids from most of the sites were similar in composition to present day ocean water, and in some sites almost identical. However, interstitial fluids from Site 53 (Philippine Sea) showed changes in ionic composition which were beyond those previously considered attributable to diagenetic influence. These samples show the beginnings of metamorphism by dramatic increases in calcium concentrations and corresponding decreases in alkali concentrations. Increases in calcium concentration to over 3000 ppm were encountered in Site 53; these contrast sharply with values of about 400 ppm for oceanic waters and common pore fluid values. The concentrations of major and minor constituents are tabulated. (See also W71-07287) (Woodard-USGS)
W71-07288

INTERSTITIAL WATER CHEMISTRY: DEEP SEA DRILLING PROJECT, LEG 6,
California Univ., Los Angeles. Dept. of Geology; and California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
B. J. Presley, and I. R. Kaplan.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 Price - $15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 823-828, Feb 1971: Washington, DC, US Government Printing Office. 6 p, 2 tab, 4 ref. NSF Contract C-482.

Descriptors: *Core drilling, *Connate water, *Sediments, *Pacific Ocean, *Water chemistry, Interstices, Marine geology, Sampling, Water quality, Chemical analysis, Analytical techniques, Data collections, Porosity, Water storage.
Identifiers: *Interstitial water, Sediment waters, Philippine Sea.

The interstitial water from cores taken between Hawaii and Guam consist of 49 samples of approximately 5 milliliters each, 4 samples of approximately 100 milliliters each, and 4 samples of approximately 10 mililiters each. These pore waters were squeezed from sediment consisting primarily of biogenic oozes and volcanic ash, and were collected at 14 sites in the NW Pacific Ocean and Philippine Seas. Analysis was started as soon as the samples had arrived at UCLA, nevertheless, as much as 3 months had then elapsed after collection. The iron, cobalt and copper concentrations show less variation than values obtained previously. This could be due to the more uniform lithology of the Leg 6 sediments. Biogenic oozes yield pore waters somewhat enriched in these trace metals, when compared to terrigenous-derived sediments. Chemical analyses data re tabulated. (See also W71-07287) (Woodard-USGS)
W71-07289

GRAIN SIZE RESULTS AND COMPOSITION OF THE SAND FRACTION, LEG 6,
Scripps Institution of Oceanography, La Jolla, Calif.
A. C. Pimm.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402-Price-$15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 709-737, Feb 1971: Washington, DC, US Government Printing Office. 29 p, 2 fig, 3 plate, 2 tab. NSF Contract C-482.

Descriptors: *Sedimentology, *Pacific Ocean, *Core drilling, *Sediments, *Particle size, Marine geology, Physical properties, Sampling, Methodology, Data collections, Sediment transport, Deposition (Sediments), Sands.
Identifiers: *Sand fraction.

The complete grain size results from analyses of sediment core samples from the Northwest Pacific Ocean are tabulated. The sand fraction recovered from the grain size analysis was examined under a binocular microscope. A complete summary of the composition of the sand fraction is given. In brief, the sand fraction of chalk oozes is dominated by planktonic foraminifera. Siliceous microfossils are rare in the chalk oozes and are usually only present in Upper Oligocene and younger sediment being most common in the Caroline Ridge sites. Detrital and authigenic minerals are extremely rare and probably make up less than 1% of the total sand fraction. (See also W71-07287) (Woodard-USGS)
W71-07290

SEDIMENTOLOGY SYNTHESIS: LITHOLOGY, CHEMISTRY AND PHYSICAL PROPERTIES OF SEDIMENTS IN THE NORTHWESTERN PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.; and California Univ., Santa Cruz.
A. C. Pimm, R. E. Garrison, and R. E. Boyce
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 - Price - $15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 1131-1252, Feb 1971, Washington, DC, US Government Printing Office. 121 p, 15 fig, 38 plate, 8 tab, 24 ref. NSF Contract C-482.

Descriptors: *Sedimentology, *Pacific Ocean, *Core drilling, *Sediments, Petrography, Chemical properties, Physical properties, Marine geology, Mineralogy, Sampling, Data collections, Instrumentation, Methodology, Sediment transport, Deposition (Sediments).
Identifiers: *Philippine Sea.

Brown clay was recovered from core sediment samples at 8 sampling sites in the Northwest Pacific Ocean. Of these sites, 4 were in water depths exceeding 5000 meters with brown clay ranging in age from Recent to Upper Cretaceous. Two of these sites contain carbonates in the Middle to Lower Cretaceous. Two sites were in water depths ranging from 4300 to 4600 meters and only contain brown clay in the Upper Tertiary. One site has some interbedded marl ooze with the brown clay in the Pleistocene; the water depth there was 4282 meters and, therefore, is probably close to the calcium carbonate compensation depth. The distribution of the brown clay is closely related to water depth and on the evidence of drilling during Leg 6, occurs everywhere in the West Pacific in water deeper than about 4000 to 4200 meters and in the Philippine Sea in water deeper than 4500 meters. (See also W71-07287) (Woodard-USGS)
W71-07291

SILVER-108m IN BIOTA AND SEDIMENTS AT BIKINI AND ENIWETOK ATOLLS,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05B.
W71-07600

HOLOCENE SEDIMENTATION RATES IN OVERBANK DEPOSITS IN THE BLACK BOTTOM OF THE LOWER OHIO RIVER, SOUTHERN ILLINOIS,
Illinois Univ., Urbana. Dept. of Geography.
Charles S. Alexander, and Jean Cutler Prior.
American Journal of Science, Vol 270, No 5, p 361-372, May 1971. 12 p, 6 fig, 2 tab, 14 ref.

Descriptors: *Sedimentation, *Ohio River, *Sedimentation rates, *Radioactive dating, Sedimentary structures, Deposition (Sediments), Sediment distribution, Sediment load, Sediment yield, Carbon radioisotopes, Flood plains, Alluvium, Alluvial channels.
Identifiers: *Natural levees.

Radiocarbon dates of organic matter collected from the alluvium of the Black Bottom portion of the Ohio River flood plain indicate three rates of sedimentation in the recent past, in natural levee, swale, and ridge deposition. All rates reflect the varied environments of deposition on the flood plain and can be ordered with regard to increasing intensity as follows: ridge deposition, swale fill, and natural levee deposition. The persistence of deposition on the ridges and swales despite the more rapid levee growth requires some periodic restraint upon levee sedimentation--probably by episodes of river bank erosion. Periods of river bank erosion interspersed with river bank deposition could account for the long term dynamic stability in the river margin. The slowly increasing rate of deposition may be related to the gradual decline in the flow of excess Ohio River flood waters through the adjacent Cache Valley beginning about 8000 years ago and to vegetation disturbance by upriver cultivation during the last 1500 years. (Knapp-USGS)
W71-07606

OREGON AND NORTHERN CALIFORNIA COASTAL RECONNAISSANCE,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
Richard J. Russell.
Louisiana State University Coastal Studies Institute Technical Report 86, Aug 30, 1970. 25 p, 1 map, 18 photo, 16 ref. ONR Contract N00014-69-A-0211-0003, Project NR388002.

Descriptors: *Beach erosion, *Coasts, *Marine geology, *Oregon, *California, Subsurface flow, Zone of aeration, Hydrogeology, Zone of saturation, Groundwater movement, Water table, Water level fluctuations, Bedrock, Shoals, Reefs, Shores, Oceans, Recreation, Boats, Geomorphology, Erosion.
Identifiers: *Coastal landforms, Sea cliffs, Beach rock.

Erosion of sea cliffs above and below the water table in Oregon and northern California was studied during a reconnaissance in April and May 1970. Retreat of sea cliffs in the zone of aeration above groundwater level is associated with the development of platforms of marine abrasion toward the top of the underlying zone of cementation, where rock is more durable. Pseudo-beach rock in sandy beaches consists of bedrock abraded along the zone of water table fluctuation. Some general comments on coastal landforms are included and some applications are indicated for users of small boats. (Woodard-USGS)
W71-07610

SEDIMENT PATTERNS, PHYSICAL CHARACTERS OF THE WATER MASS AND FORAMINIFERIDA DISTRIBUTION IN INDIAN RIVER, BAY, COASTAL DELAWARE,
Delaware Univ., Newark. Dept. of Geology; and Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 02L.
W71-07612

BED LOAD TRANSPORTATION IN ALLUVIAL CHANNELS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
Satya P. Garg, A. K. Agrawal, and Prem Raj Singh.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY 5, Paper 8091, p 653-664, May 1971. 12 p, 4 fig, 1 tab, 18 ref, append.

Descriptors: *Bed load, *Sediment transport, *Alluvial channels, Hydraulic models, Flumes, Equations, Hydraulics, Tractive forces, Sedimentation.
Identifiers: Flume models.

A new approach for calculation of bed load considers the total energy balance of flows in mobile bed channels. The proposed equation utilizes the known hydraulic parameters and sediment characteristics along with the Shields' critical tractive force curve. Experiments were conducted in a 158 ft long and 4-ft wide flume having glass sides. The mean grain sizes for the experimental sand, as calculated by Simpson's formula, were 0.289 mm, 0.49 mm, and 0.534 mm. The sediment transport calculated from the proposed equation was compared with the measured value. The correspondence of the observed and computed bed load transport is quite satisfactory for the plotted data. (Knapp-USGS)
W71-07613

NOTE ON REMOVAL OF SULFUR INTERFERENCES FROM SEDIMENT EXTRACTS FOR PESTICIDE ANALYSIS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-07621

CLASSIFICATION AND REGIONALIZATION OF TORRENTIAL MUDFLOWS IN THE UKRAINIAN CARPATHIANS (KLASSIFIKATSIYA SELEY I RAYONIROVANIYE BASSEYNOV SELEOPASNYKH REK UKRAINSKIKH KARPAT),
For primary bibliographic entry see Field 02E.
W71-07657

LANDSLIDING IN THE VICINITY OF THE VAN NORMAN LAKES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07660

2K. Chemical Processes

IDENTIFICATION OF PETROLEUM PRODUCTS IN WATER,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05A.
W71-07240

ION PAIRING IN 2:2 COMPLEX ION ELECTROLYTES: (Co (NH3)5NO2)SO4,
Connecticut Univ., Storrs. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W71-07248

PREDICTION OF SATURATION PRECIPITATION OF LOW SOLUBILITY INORGANIC SALTS FROM SUBSURFACE WATERS UNDER CONDITIONS OF TOTAL CONCENTRATION, TEMPERATURE AND PRESSURE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
R. O. Van Everdingen.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch, Technical Bulletin No 30, 1970. 13 p, 5 fig, 3 tab, 10 ref, append.

Descriptors: *Saturation, *Chemical precipitation, *Subsurface waters, *Solubility, Temperature, Pressure, Salts, Aqueous solutions, Chemical analysis, Hydrologic data, Evaporation, Ionization, Mathematical studies, Water chemistry.
Identifiers: *Solubility graphs.

Graphs are presented that enable the determination of the degree of saturation of aqueous solutions with respect to BaSO4, CaSO4, SrSO4, BaF2, CaF2 and MgF2 under a variety of conditions of temperature, pressure and total-salt concentration. Also presented are examples of the influence of temperature changes, dilution, evaporation, addition of non-common salt, and mixing, on the degree of saturation. (Woodard-USGS)
W71-07249

SOURCES OF NITROGEN IN WATER SUPPLIES,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-07255

THE USE OF ULTRA-VIOLET ABSORPTION MEASUREMENTS FOR THE ESTIMATION OF ORGANIC POLLUTION IN INSHORE SEA WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05A.
W71-07256

FATTY ACID DIAGENESIS IN RECENT SEDIMENT FROM NARRAGANSETT BAY, RHODE ISLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 02J.
W71-07261

ANOMALOUS WATER, POROUS GLASS AND SILICIC ACID,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 01A.
W71-07263

WATER DYNAMICS IN CLAYS BY NEUTRON SPECTROSCOPY,
Sydney Univ. (Australia). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 02G.
W71-07264

PHYSICO-CHEMICAL PROPERTIES OF SOLS AND GELS OF Na-MONTMORILLONITE WITH AND WITHOUT ADSORBED HYDROUS ALUMINUM OXIDE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W71-07275

THE DIFFUSION AND CONSUMPTION OF OXYGEN IN SUBMERGED SOILS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W71-07280

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 6,
Geological Survey, Woods Hole, Mass.; and Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W71-07288

INTERSTITIAL WATER CHEMISTRY: DEEP SEA DRILLING PROJECT, LEG 6,
California Univ., Los Angeles. Dept. of Geology; and California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 02J.
W71-07289

SEDIMENTOLOGY SYNTHESIS: LITHOLOGY, CHEMISTRY AND PHYSICAL PROPERTIES OF SEDIMENTS IN THE NORTHWESTERN PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.; and California Univ., Santa Cruz.
For primary bibliographic entry see Field 02J.
W71-07291

CHARACTERIZATION OF BOTTOM SEDIMENTS: CATION EXCHANGE CAPACITY AND EXCHANGEABLE CATION STATUS,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
Stephen J. Toth, and Arthur N. Ott.
Environmental Science and Technology, Vol 4, No 11 p 935-939, Nov 1970. 4 tab, 11 ref.

Descriptors: *Cation exchange, *Sediments, *Encroachment, *Water pollution, Soil analysis, Analytical techniques, Organic matter, Delaware River, Hudson River, Ponds, Freshwater, New Jersey, Pennsylvania, Saline water.
Identifiers: Sample preservation, Chesapeake Bay, Barnegat Bay.

Modifications were determined of soil characterization methods which would be required to characterize bottom sediments based upon samples taken from some rivers, bays, and freshwater impoundments. Two PARAMETERS WERE USED: cation exchange capacity (CEC) and exchangeable cation status (ECS). CEC is the ability of an exchanger, expressed in terms of me. per 100 g, to retain a specific cation at a certain pH value and salt concentration. ECS, expressed in like terms, refers to the amount of Na, K, Ca, Mg, and H held by the soil complex. It was determined that CEC and ECS values can be utilized in determining salt-water intrusions and pollution effects. These values need to be determined on fresh or frozen and thawed sediments since drying reduces CEC and exchangeable Fe and Mn contents. Exchangeable H ions cannot be determined in NH4OAc extracts because large amounts of dispersed organic matter and exchangeable Fe and Mn are present. There are extremely wide variations found in CEC and ECS values. The organic content of bottom sediments is responsible for about 80 percent of the CEC. (Mortland-Battelle)
W71-07390

DYNAMICS OF NUTRIENT CONCENTRATIONS IN THE ILLINOIS RIVER,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 02H.
W71-07407

DETERMINATION OF FLUORIDE POLLUTANTS IN NATURAL WATERS USING A KNOWN-ADDITION TECHNIQUE,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-07457

POLYWATER ON SILICA-FREE SUBSTRATES,
Commonwealth Scientific and Industrial Research Organization, Ryde (Australia). Div. of Food Preservation.
For primary bibliographic entry see Field 01B.
W71-07603

SIMULTANEOUS DETERMINATION OF ARSENATE AND PHOSPHATE IN NATURAL WATERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05A.
W71-07617

POTENTIAL APPLICATION OF AN INFRARED SPECTRORADIOMETER FOR REMOTE DETECTION AND IDENTIFICATION OF OIL SLICKS ON WATER,
Gulf General Atomic Co., San Diego, Calif.
For primary bibliographic entry see Field 05A.
W71-07618

DETERMINATION OF CALCIUM BY RADIOCHEMICAL REPLACEMENT,
Reading Univ. (England).
H. J. M. Bowen.
Analyst, Vol 96, No 1140, p 220-222, Mar 1971. 3 p, 2 fig, 1 tab, 11 ref.

Descriptors: *Water chemistry, *Chemical analysis, *Calcium, *Radiochemical analysis, Analytical techniques, Instrumentation.
Identifiers: *Calcium determination, Radiochemical replacement, Oxalates, Silver-110, Manganese-54, Cobalt-60.

Calcium ions in solution may be determined by radiochemical replacement of silver-110 in labeled solid silver oxalate, cobalt-60 in labeled cobalt oxalate and manganese-54 in labeled manganese oxalate. A one-to-one replacement was observed with manganese oxalate. The technique can be used to determine 25 to 100 micromole per ml (100 to 4000 micrograms per ml) of calcium, and the lower limit is reduced to 16 micrograms per ml by using a 50 percent methanol solution. Magnesium interferes to only a small extent. Each determination takes less than 5 minutes, and the precision is 2 percent. (Woodard-USGS)
W71-07640

PROPYLENE CARBONATE EXTRACTION OF TRIS (PENTAN-2, 4-DIONE)-IRON (III) FROM AQUEOUS SOLUTION: APPLICATION TO THE

SPECTROPHOTOMETRIC DETERMINATION OF IRON,
Wofford Coll. Spartanburg, S.C. Dept. of Chemistry.
B. G. Stephens, James C. Loftin, William C. Looney, and Kenneth A. Williams.
Analyst, Vol 96, No 1140, p 230-234, Mar 1971. 5 p, 1 fig, 3 tab, 8 ref.

Descriptors: *Water chemistry, *Chemical analysis, *Iron, *Aqueous solutions, *Spectrophotometry, Carbonates, Analytical techniques, Instrumentation.
Identifiers: *Propylene carbonate, Reagents.

Orange tris (pentan-2, 4-dione) iron (III) was extracted from aqueous solution into propylene carbonate at pH 4.0 to 9.0. Distribution coefficients ranged from 23.9 to 116, depending on the ionic strength and pH of the aqueous phase. Relative standard deviations of the spectrophotometric methods developed are 1.52 percent or less and these methods are applicable to the routine determination of 56 to 391 micrograms of iron. (Woodard-USGS)
W71-07641

THIAMINE LIMITED STEADY STATE GROWTH OF THE YEAST CRYPTOCOCCUS ALBIDUS,
Alaska Univ., College. Inst. of Marine Science.
D. K. Button.
University of Alaska, College, Institute of Marine Science, Mimeo, (Undated). 20 p, 4 fig, 3 tab, 15 ref. OWRR Project A-007-ALAS (3).

Descriptors: *Vitamin B, *Growth rates, *Yeasts, Microogranisms, Mathematical models, Nutrients, Temperature, Hydrogen ion concentration, Energy, Population, Oxygen, Enzymes.
Identifiers: *Thiamine, *Cryptococcus albidus, Continuous culture, Batch growth, Stirring rate.

The concentration-growth rate relationship of a thiamine-requiring microorganism was examined. Cryptococcus albidus was selected on the basis of its thiamine requirement, marine origin, and amenability to continuous culture. Although oscillations in the organism population were generated under some nutritional conditions, such as manganese deficiency, the thiamine limited steady state was smooth and constant. Thiamine free glucose was prepared by irradiating the required amount of recrystallized glucose in a small quarts tube for one hour with an ultraviolet lamp. The half life of thiamine is in the order of minutes under these conditions. Data suggest a diffusion limited mechanism characterized by an apparent Michaelis constant for growth of 0.47 picomoles. This relationship was obtained from continuous culture at steady state and checked by a non-steady state procedure and in batch growth. These checks were compatible with the value reported. It was concluded that most natural water systems have sufficient thiamine to support some thiamine-requiring microorganisms at above rate limiting concentrations. Thus where thiamine is an important factor in the ecology of heterotrophic systems it is probably in a range below current means of analytical detection. (Jones-Wisconsin)
W71-07678

ORIGIN OF COLORS AND IRONSTONE BANDS IN THE COLUMBIA FORMATION, MIDDLETOWN-ODESSA AREA, DELWARE,
Delaware Geological Survey, Newark.
N. Spoljaric.
Southeastern Geology, Vol 12, No 4, p 253-266, Apr 1971. 14 p, 7 fig, 2 tab, 18 ref. OWRR Project B-002-DEL (3).

Descriptors: *Delware, *Water chemistry, *Iron, *Groundwater movement, Chemical precipitation, Water levels, Water table, Leaching, Water quality, Aquifers, Sands, Sandstones, Mineralogy, Geology, Geochemistry.
Identifiers: Columbia Formation (Del).

Colors in the Columbia Formation (Pleistocene) in the study area are dependent on the amount of iron present. The source of iron found in these sediments is the underlying greensand of the Rancocas Formation (Paleocene-Eocene age). Iron seems to have been transported from its source by groundwater and precipitated in the capillary fringe zone and zone of watertable fluctuations. Ironstone bands, however, are thought to have been formed in the zone by aeration by the precipitation of iron from groundwater. In general there is no relationship between the shape and size of the ironstone bands and the textures and structures of the sediments that contain them. The shapes of the bands reflect the type of the groundwater flow at the time of formation. (Knapp-USGS)
W71-07692

2L. Estuaries

CARBON BUDGET AND TOTAL PRODUCTIVITY OF AN ESTUARINE OXIDATION POND RECEIVING SECONDARY SEWAGE EFFLUENT,
Institute for Environmental Health Studies, Morehead City, N.C.
For primary bibliographic entry see Field 05D.
W71-07092

EFFECTS OF POLYSTREAM AND DRILLEX ON OYSTER SETTING IN CHESAPEAKE BAY AND CHINCOTEAGUE BAY,
Bureau of Commercial Fisheries, Oxford, Md. Biological Lab.
For primary bibliographic entry see Field 05C.
W71-07146

TILLAMOOK BAY, OREGON.
Corps of Engineers, Washington, D.C. Committee on Tidal Hydraulics.

Printed by US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Jan 1970. 15 p, 2 pl.

Descriptors: *Jetties, *Channel improvement, Estuaries.
Identifiers: *Tillamook Bay (Ore), Jetty spacing.

Committee on Tidal Hydraulics was requested to review plans for construction of south jetty, approximately 7800 ft in length, at entrance to Tillamook Bay, primarily to provide protection for navigation against southwesterly storm waves but also to reduce maintenance requirements of channel. Proposed spacing between north and south jetties, if a deep-draft channel is authorized in the future, has been questioned. Pertinent information on tidal prism, littoral drift, ecological (oyster bed) considerations, discharge and current velocities, and south jetty plans are given in this report. Conclusions of Committee are presented along with recommendations which include a revised alignment for south jetty, a surveillance program, and a small-scale fixed-bed hydraulic model to study interrelation of jetty spacing and tidal prism. (Spivey-WES)
W71-07174

THE LAW PERTAINING TO ESTUARINE LANDS IN SOUTH CAROLINA,
For primary bibliographic entry see Field 06E.
W71-07208

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07215

THE USE OF ULTRA-VIOLET ABSORPTION MEASUREMENTS FOR THE ESTIMATION OF ORGANIC POLLUTION IN INSHORE SEA WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05A.
W71-07256

A COMPUTER BASED FLORISTIC ANALYSIS OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
Vincent J. Bellis.
Copies available from Water Resources Research Inst, 124 Riddick Bldg, North Carolina State Univ, Raleigh, NC, 27607, Price $2.50. North Carolina University Water Resources Research Institute Report No 46, Jan 1971. 28 p, 7 fig, 5 tab, 13 ref. OWRR Project A-044-NC (1) Agreement No 14-31-0001-3033, FY 1970.

Descriptors: *Esturaries, *Phytoplankton, *Distribution patterns, *North Carolina, *Computer programs, Data processing, Data collections, Variability, Probability, Water pollution effects, Algae, Aquatic habitats, Aquatic environment.
Identifiers: *Pamlico River (NC).

A computer based technique for analyzing distribution patterns among estuarine organisms was developed and tested on phytoplankton collections from Pamlico River, North Carolina. Jaccard's coefficient of similarity was used to generate a similarity matrix with final printout in dendrogram form showing clusters of collections having inherent similarity. Use of a similarity index based solely upon presence or absence of species within all possible pairs of data collections produced a dendrogram which described the seasonal periodicity of phytoplankton in the central Pamlico River. Computer programs developed in this project are written in Fortran IV and have been deposited in the program library of the East Carolina University Computer Center and can be obtained upon request from its director. (Knapp-USGS)
W71-07337

CHARACTERIZATION OF BOTTOM SEDIMENTS: CATION EXCHANGE CAPACITY AND EXCHANGEABLE CATION STATUS,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 02K.
W71-07390

THERMAL INVESTIGATIONS IN CALIFORNIA,
Pacific Gas and Electric Co., Emeryville, Calif.
For primary bibliographic entry see Field 05C.
W71-07420

THE ESTUARINE VERSION OF THE COL HEAT DIGITAL SIMULATION MODEL,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05B.
W71-07428

SEDIMENT PATTERNS, PHYSICAL CHARACTERS OF THE WATER MASS AND FORAMINIFERIDA DISTRIBUTION IN INDIAN RIVER, BAY, COASTAL DELAWARE,
Delaware Univ., Newark. Dept. of Geology, and Oregon State Univ., Corvallis. Dept. of Oceanography.
John C. Kraft, and Gertrude Margules.
Southeastern Geology, Vol 12, No 4, p 223-252, Apr 1971. 30 p, 17 fig, 21 ref, append. NSF Grant GP-5604.

Descriptors: *Bottom sediments, *Estuaries, *Benthos, *Distribution patterns, *Delaware, Benthic fauna, Aquatic microorganisms, Sedimentation, Water quality, Saline water intrusion, Water temperature, Salinity, Water chemistry.

dentifiers: Indian River Estuary (Del).

The physiographic setting, bottom sediment facies patterns, salinity, temperature, pH, Eh, and organic content of the water mass and bottom sediments of the Indian River Estuary, Delaware, were correated with the distribution of living benthonic Foraminiferida. Twelve genera, including 23 spe-ies of Foraminiferida, were tentatively identified nd separated into six geographically defined facies roups. No significant correlation was found etween patterns of foraminiferal abundance and he distribution of sediment types. Furthermore, vith the exception of an Ammobaculites assemblage occuring in the tidal streams to the west, here is no significant association between species ccurrence and the physical parameters observed. The species of benthonic Foraminiferida found liv-ng in the Indian River estuary system appear to be olerant of highly varied bottom sediment types and hysical characteristics of the water mass. (Knapp-USGS)
W71-07612

A SURVEY OF THE PROBLEMS AND RESEARCH NEEDS IN THE COASTAL ZONE,
Old Dominion Univ. Research Foundation, Norolk, Va.
William J. Hanna, Harold G. Marshall, and James F. Slowey.
Available from the National Technical Information Service as N70-40812, $3.00 in paper copy, $0.95 n microfiche. NASA Report CR-11780, Sept 15, 970. 103 p, 66 ref. Contract No NAS 1-9434-13.

Descriptors: Research and development, Pollutants, Biology, Estuaries, *Fisheries, *Oceanography, *Chemical analysis, *Geologic investigations, *Air-water interfaces, *Meteorology, *Data ollection, Sampling, Remote sensing.
dentifiers: Earth Resources Satellite.

An investigation to establish the major problems nd research needs in the coastal zone was conducted. Biology, chemical and physical oceanography, geology and metcorology were the isciplines studied with emphasis on interdisciplinary requirements. Recommendations were made or more physical data on water circulation, current patterns and their temporal variations; temperature, salinity and mixing data; extensive in situ amplings; surface waves; sea and shore interaction nd seabed conditions, all of which are basic to olving the major problem of pollution. Recommendations were also made for cooperation etween NASA and NSF concerning ERTS application to the International Decade of Oceanographic Exploration. (Ensign-PAI)
W71-07673

THIAMINE LIMITED STEADY STATE GROWTH OF THE YEAST CRYPTOCOCCUS ALBIDUS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02K.
W71-07678

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SALINE WATER CONVERSION PROGRAM--APPROPRIATION.
For primary bibliographic entry see Field 06E.
W71-07491

ELECTRODIALYSIS FOR DESALTING HAWAIIAN BRACKISH GROUNDWATER: A FIELD STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
.. Stephen Lau, and James C. S. Chou.

Water Resources Research Center Technical Report No 41, University of Hawaii, Honolulu, July 1970. 20 p, 4 fig, 4 tab, 24 ref.

Descriptors: *Desalinization, Hawaii, *Electrodialysis, *Brackish water, Water treatment.
Identifiers: Brackish groundwater, Groundwater pollution.

A field study was made to evaluate the applicability and problems of desalting brackish groundwater from basaltic and reef limestone aquifers in Honolulu, Hawaii with the electrodialysis process. The three-week study indicated that the brackish water at both sites was upgraded to potable quality and the rejection of ionized salts was above 80 percent. No pretreatment was necessary. Both the average production and rejection rates were about 420 gpd. An economic evaluation was not determinable from the short-term results. (Lau-Hawaii)
W71-07681

3B. Water Yield Improvement

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Inst., Philadelphia, Pa.

Available from the National Technical Information Service as PB-198 433, $3.00 in paper copy, $0.95 in microfiche. Philadelphia, University City Science Institute, Mar 22, 1971. 132 p, 12 fig, 19 tab, 43 ref. USCI-ES-3.

Descriptors: *Water management (Applied), *Water resources development, Cost-benefit analysis, Technical feasibility, Water supply, Water demand, Reservoirs, Dams, Inter-basin transfer, Artificial recharge, Ecology, Recreation.
Identifiers: *New Castle County, Delaware, Schuylkill River, Susquehanna River.

This study concludes that current water demand exceeds current safe yield in New Castle County, Delaware, that the deficit may increase by 2 to 3 million gallons per day in the near future, and that, from the economic and engineering viewpoints, the proposed White Clay Creek Dam and Reservoir has the greatest prospect of any proposed project for increasing water supply. Previous engineering, economic, and feasibility studies of the water resources and demand projections in the county are reviewed. Aspects discussed include: projected water demand and county needs, an economic analysis of the White Clay Creek Dam and Reservoir proposal, other currently feasible alternatives, groundwater development, a study of the ecological and aesthetic aspects of the reservoir site, and a projection of economic conditions and financing alternatives. Other alternatives discussed include an interbasin transfer from the Schuylkill and Susquehanna Rivers to the White Clay Creek, proposed by the Mason-Dixon Task Force, and a large-scale artificial groundwater recharge project. (Dorr-UCSC)
W71-07064

WATER AND SEWER PLAN AND PROGRAM, 1970.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 05D.
W71-07202

FINAL REPORT ON RESEARCH AND ENGINEERING DEVELOPMENT AND EVALUATION OF ICE NUCLEI DISPERSION SYSTEMS, MAY 1, 1967 TO MAY 1, 1970.
Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.

Available from National Technical Information Service, as PB-196 149, $3.00 in paper copy, $0.95 in microfiche. Colorado State University, Atmospheric Simulation Laboratory Report 1970. 61 p, 39 fig, 8 ref, append. Bur Reclam Contract No 14-06-D-6170.

Descriptors: *Cloud seeding, *Silver iodide, *Equipment, Weather modification, Condensation, Water management (Applied).
Identifiers: *Silver iodide sources, *Nuclei generators.

Design and development of ground and airborne steady-state ice nuclei generators for field application are described. Performance, reliability, ease of maintenance, simplicity, and cost improvements were necessary and were accomplished. Units were needed capable of remote operation. Design of a new prototype generator with improved performance is described; nucleating materials, carriers, and fuels are discussed; and results of extensive field tests are given. (Knapp-USGS)
W71-07243

CRISIS IN WATER SUPPLY,
For primary bibliographic entry see Field 06B.
W71-07282

WATER FOR THE FUTURE OF LONG ISLAND, NEW YORK,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 06B.
W71-07293

3C. Use of Water of Impaired Quality

THE ECONOMIC FEASIBILITY OF ESTABLISHING AN IRRIGATED FORESTRY ENTERPRISE ON THE HANFORD RESERVATION, WASHINGTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05D.
W71-07152

CATFISH CULTURE IN EFFLUENT WATER,
State Coll. of Arkansas, Conway.
For primary bibliographic entry see Field 05C.
W71-07343

3F. Conservation in Agriculture

A DECADE OF STABILIZATION LAGOONS IN MICHIGAN WITH IRRIGATION AS ULTIMATE DISPOSAL OF EFFLUENT,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 05D.
W71-07089

GROWTH AND PERFORMANCE OF COTTON IN A DESERT ENVIRONMENT: I. MORPHOLOGICAL DEVELOPMENT OF THE CROP; II. DRY MATTER PRODUCTION; III. CROP PERFORMANCE,
Cotton Research Corp., Namulonge (Uganda). Cotton Research Station.
A. B. Hearn.
Journal of Agricultural Science, Camb, 1969, Vol 73, No 1, I. p 65-74, II. p 75-86, III. p 87-97. 19 fig, 13 tab, 65 ref.

Descriptors: *Cotton, *Plant growth, *Plant morphology, *Environmental effects, *Fiber crops, Arid lands, Deserts, Planting management, Crop production, Crop response, Plant physiology, Flood irrigation, Alluvium, Sierozem, Soil-water-plant relationships, Varieties, Spatial distribution, Irrigation water, Equations, Economic efficiency, Effects, Photosynthesis, Leaves, Carbon dioxide, Light, Soil water, Evapotranspiration, Seeds.

Identifiers: *Dry matter production, *Plant requirements, Yemen, Dry weight, Unit leaf-area index, Beer's law.

Agriculture in southern Yeman is based on annual spate floods, deep alluvial soils, and deep-rooted crops such as cotton. General principles of cotton growth were studied under a variety of experiments in 1963 and 1964. The results of variety, sowing date, irrigation water and plant spacing tests indicate that morphological change and dry weight increase are linked to predict crop performance. An exponential equation is developed for dry weight and unit leaf-area index, based on Beer's Law as opposed to linear regression. Varieties and agronomic practices are discussed in economic terms. An empirical relationship between water, dry matter production and cotton seed yield is evaluated physically and biologically based on work by Penman and deWit, and practically based on commercial yields and watering rates. Experimental procedure for I includes number of mainstem notes, variety, water, branches, fruiting points, and treatment effects. Potential photosynthesis, leaf distribution, CO sub 2 exchange resistance, light, vegetative and reproductive growth are evaluated for II. Soil water, evapotranspiration, seed cotton, plant weight and structure, water, mainstem, fruiting points, and boll and fibre character are investigated in III. (Popkin-Arizona)
W71-07154

ROOT ELONGATION RATES OF COTTON AND PEANUTS AS A FUNCTION OF SOIL STRENGTH AND SOIL WATER CONTENT,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 02G.
W71-07157

IRRIGATION RESEARCH PROGRESS REPORT 1970, OKLAHOMA IRRIGATION RESEARCH STATION, ALTUS, OKLAHOMA.
Oklahoma Irrigation Experiment Station, Altus.

Oklahoma State University, Agricultural Experiment Station, Progress Report, P-639, Sept 1970. 29 p.

Descriptors: *Irrigation practices, *Fertility, *Soil-water-plant relationships, *Water conservation, *Oklahoma, Varieties, Testing, Soil management, Insect control, Weed control, Fiber crops, Crop production, Cotton, Projects, Nitrogen, Vertilicillium, Wilting, Forages, Entomology, Cultivation, Grains (Crops), Soybeans, Sorghum, Wheat.
Identifiers: *Irrigated crops, Cropping systems, Row spacing, Seedbed preparation, Thermal effects, Leaf rust.

Research of the Oklahoma Irrigation Research Station at Altus during 1970 includes irrigation problems, soil fertility, variety testing, soil management, insect and weed control, cropping systems, and food, feed and fiber crops production. The field station in southwestern Oklahoma receives 24.5 inches of rainfall annually, and has an average summer and winter temperature of 83.0 and 43.0 degrees F. Soils are Tillman and Hollister clay loams with 0 to 1 percent slopes, and pH range from 6.5 to 8.0. Lower than average rainfall, and high temperatures reduced insect problems on cotton in 1970. Twenty-one current projects are summarized, 6 of which deal with irrigated cotton in terms of test varieties, verticillium wilt, nitrogen-verticillium interaction and row spacing. One project involves testing establishment and management of forages. Other projects include weed control, entomology and cotton fertility, seedbed preparation, tillage and thermal effects, small grains and leaf rust, and soybean, grain sorghum and wheat investigations. Most results are forth coming, as experiments require more years of data. (Popkin-Arizona)
W71-07158

PRODUCING WATERMELONS IN KANSAS,
Kansas State Univ., Manhattan. Dept. of Horticulture and Forestry.
Charles V. Hall.
Kansas State University, Agricultural Experiment Station, Bulletin 532, Feb 1970. 16 p, 2 tab, 17 fig. Kansas Agricultural Experiment Station Contribution No 455.

Descriptors: *Crop production, *Melons, *Kansas, *Plant growth, *Irrigation practices, Vine crops, Root systems, Field capacity, Fruit crops, Sands, Plant diseases, Flowering, Crop response, Consumptive use, Soil moisture, Drought resistance, Marketing, Harvesting, Weed control, Insect control, Mulching, Planting management, Fertilization, Irrigable land, River beds, Varieties, Soil water, Soil-water-plant relationships.
Identifiers: *Growing season, *Crop requirements, Ripening, Storing, Handling, Transplanting, Site selection, Soil preparation.

Watermelons, which serve as an important water source in central and arid Africa, survive the desert climate, and absorb and store soil water. Varieties are grown in Kansas along river valleys, in sandy soils, and in irrigated semiarid areas. Growing technique and problems are discussed under site selection and soil preparation, fertilization, planting or transplanting, plastic mulches, irrigation, and control of insects, disease and weeds. Harvesting, handling, storing and marketing techniques are outlined. Irrigation is necessary in western Kansas and beneficial in eastern Kansas, though watermelons are fairly drought resistant. Soil moisture throughout the early growing season must be adequate to maintain healthy growth and yield vigorous blossoms. Healthy watermelons permit irrigation reduction during ripening. Watermelons benefit from irrigation if soil moisture content is low, when vining starts, when blossoms appear, and as fruit are growing. Water applied should bring soil moisture to field capacity 2 to 3 feet deep because of the deep-root system. (Popkin-Arizona)
W71-07160

THE ARIZONA LETTUCE INDUSTRY: COMPETITION, PRICES, DEMAND, SUPPLY CONTROL,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
Robert S. Firch, and Daniel W. Mathews.
Arizona Agricultural Experiment Station, Technical Bulletin 188, Jan 1971. 10 p, 6 tab, 4 fig, 3 ref. Regional Research Project WM-58.

Descriptors: *Arizona, *Lettuce, *Competition, *Prices, *Demand, Water conservation, Fertilizers, Benefits, Economics, Profit, Costs, Organizations, Income, Optimization, Stabilization, Seasonal, Quality control, Harvesting, Varieties, Supply, Crop production, California, Arid lands.
Identifiers: *Supply control, Irrigated crop, Shipping costs, Harvest costs, Quantity sold, FOB Price, Grower net revenue, Salinas (Cal), Yuma (Ariz), Imperial Valley (Cal).

Lettuce, an important irrigated crop in the arid southwest, is a dynamic industry, where California and Arizona produce 80% of the total supply for the US and Canada. Arizona is too warm for commercial summer production; the Salinas area of California produces summer lettuce; Arizona's Yuma area and California's Imperial valley are the principal winter production areas. This paper, based on Mathews' masters' thesis, briefly discusses competition among western producing areas, Arizona lettuce prices and demand, and supply control and potential effects on grower net revenue. A total of 21,846 thousand cartons of lettuce were produced in Arizona in 1964-70, compared to a peak of 24,280 thousand cartons in 1961-62, and a low of 12,664 thousand cartons in 1949-50; commercial production began in Arizona in 1947-48. Lettuce prices reflect varieties changes, harvesting selectivity, and market effects of quality differences. Spring demands are stronger than winter demands. The following formula is developed to optimize and stabilize crop profits b industrial organizations. Grower Net Revenu equals (FOB Price times Quantity Sold)- (Harve and Shipping costs). (Popkin-Arizona).
W71-07162

THE EGYPTIAN AGRARIAN REFORM PROBLEMS AND PROSPECTS,
S. C. Schmidt.
Economic Planning, Vol 6, No 2, p 7-9, Mar-A 1970.

Descriptors: *Arid lands, *Economic impact, *I rigated land, *Land uses, Political aspects, Fert izers, Planning, Economic efficiency, Cooper tives, Economic feasibility.
Identifiers: *Egypt, *Agrarian reform, *Nile Rive

In Egypt, rainfall is negligible, and there is to reliance on the Nile River for irrigation water. On 3.5% of the land area is under cultivation, almo all of it being in the Nile valley. Because of limited physical resources, Egypt has only 2 pos ble avenues for agricultural development: (Bringing more land into production, which wou have to be desert land, and would therefore be e tremely expensive; (2) Intensification of cultivati in available land which is represented mainly by t Aswan High Dam. Until desalinization becom economically feasible, further intensification w be vertical and through improvement of irrigati by improvement of the country's weak draina system, more mechanization, and better fertili practices. Egyptian agriculture is labor-intensi and highly productive. Nevertheless, by 1963, had become a net food importer, reflecting t combined effects of higher population and u graded diets. Agriculture accounts for 27% of t GNP and industry accounts for 23%, but natio policy has been to increase the industrial sec because it is far less intensified than agricultu and should yield greater output/unit input. Unf tunately, so far the industrial sector has not sorbed much labor. Since 1952, extensive agrari reform has taken place and many of the landlords have been eliminated. Most agricultu output is still private, but the agrarian reform s ceeded, without harming production, because the government's takeover and improvements vital services-credit, marketing, cooperatives, rigation, drainage and land reclamation. (Cas Arizona).
W71-07163

COTTON RESEARCH STATION PROGRE REPORT--1969, CHICKASHA, OKLAHOMA.
Oklahoma State Univ., Chickasha. Cot Research Center.

Oklahoma State University, Agricultural Resear Progress Report P-622, Sept 1969. 24 p.

Descriptors: *Cotton, *Crop production, *C response, *Soil-water-plant-relationships, Fora Soybeans, Oklahoma, Irrigation programs, Str Verticillium, Wilting, Nitrogen, Harvesting, Va ties, Fiber crops, Fertilizers.
Identifiers: Row spacing, Lint production, Nurs studies.

Progress reports on 15 cotton, 4 forage an soybean studies at the Cotton Research Stat Oklahoma State University, for 1969 are s marized. One soybean and four cotton projects irrigation studies where advanced and gland strains, verticillium wilt, nitrogen-verticilli hand-harvested varieties, and soybean row spac are evaluated. Paymaster 54B had the highest yield at 596 lbs. Nursery studies exhibited acce ble fiber properties. Optimum amount of nitro fertilizer to minimize verticillium is investiga Determination of soil-water-plant relationships farm management which increases crop produc are general research goals at the station. (Pop Arizona).
W71-07164

URNING POINTS IN TIME--
AND/WATER/PEOPLE.

vailable from Soil Conservation Society of Amer-
a, 7515 Northeast Ankeny Road, Ankeny, Iowa,
0021, Price $5.00. Proceedings 25th Anniversary
leeting of the Soil Conservation Society of Amer-
a, Aug 9-12, 1970, York University, Toronto,
ntario, Canada: Soil Conservation Society of
merica, 1970. 185 p.

escriptors: *Soil conservation, *Water conserva-
on, *Reviews, *Documentation, *Conferences,
nvironment, Ecology, Water resources develop-
ent, Erosion, Sedimentation, Vegetation, Recrea-
on, Wastes, Water pollution, Land use.
lentifiers: *Conference proceedings.

he proceedings of the 25th anniversary meeting of
e Soil Conservation Society of America, August
12, 1970, at York University, Toronto, Ontario,
anada, included 27 papers concerning waste
ilization, land resources, water pollution, water
anagement, water research, soil and water con-
rvation, erosion and sedimentation, natural
egetation, and outdoor recreation. (Woodard-
SGS)
71-07294

OST OF PUMPING IRRIGATION WATER IN
RIZONA: 1891 to 1967,
rizona Univ., Tucson. Dept. of Agricultural
conomics.
or primary bibliographic entry see Field 06C.
71-07501

ENERATING SKILLED MANPOWER FOR IR-
IGATION PROJECTS IN DEVELOPING
OUNTRIES: A STUDY OF NORTHWEST
EXICO,
ter-American Development Bank, Washington,
.C.
Haissman.
/ater Resources Research, Vol 7, No 1, Feb 1971,
1-17. 3 tab.

escriptors: *Irrigation programs, Systems analy-
s, *Personnel management, Linear programming,
and tenure.
lentifiers: *Mexico, Ejidos.

simple, practical method for finding the numbers
skilled personnel necessary for the successful im-
ementation of irrigation projects in developing
ountries, and for designing a training system to
enerate this personnel is given. The occupations
itical to irrigation development and the agricul-
ral activities in which each occupation is
ployed are listed. A series of coefficients, based
ainly on the successful irrigation development in
orthwest Mexico, determines the manpower
uantities required as functions of given project
arameters. A network flows model and a linear
rogramming model are developed for designing
e appropriate training systems. (Holmes-Rut-
rs)
71-07505

CONOMIC IRRIGABILITY OF THE SOILS OF
OOSEVELT COUNTY, NEW MEXICO, 1967,
ew Mexico State Univ., University Park. Dept. of
gricultural Economics.
eter H. Metzner.
ew Mexico State University, Las Cruces, New
exico, M. S. Thesis, Oct 1969. 84 p, 18 tab, 8 fig,
2 ref, 2 append.

escriptors: *Irrigation efficiency, Economic pre-
ction, Costs, Sorghum, Cotton, Peanuts, *Soil
assifications, *New Mexico.
lentifiers: Roosevelt County (N Mex).

he author attempted to develop an analytical
odel for studying the economic potentialities of
veral types of soil when irrigated. He limited his
udy to five types of soils in Roosevelt County in
astern New Mexico and collected production data for cotton, sorghum, and peanuts on each soil type. Through the use of crop enterprise budgeting and multiple regression analysis, the author compared gross and net returns for each crop on each soil. He concluded that his choices of soils were too similar to reflect statistically significant differences. (Holmes-Rutgers)
W71-07506

SUGAR CANE IRRIGATION: A CASE STUDY IN CAPITAL BUDGETING,
McKinsey and Co., Inc., San Francisco, Calif.
For primary bibliographic entry see Field 06B.
W71-07578

CONSIDERATIONS FOR WATER USE AND MANAGEMENT IN THE BIG LOST RIVER BASIN, IDAHO; A SUPPLEMENTAL REPORT,
Geological Survey, Boise, Idaho. Water Resources Div.
E. G. Crosthwaite, C. A. Thomas, and K. L. Dyer.
Geological Survey Open-file Report, 1970. 15 p, 1 fig, 1 tab, 2 ref.

Descriptors: *Water management (Applied), *Irrigation water, *Conjunctive use, *Water storage, *Groundwater recharge, Water spreading, Irrigation efficiency, Reservoir design, Reservoir yield.
Identifiers: *Big Lost River Basin (Idaho).

Additional management of the surface-water resources in the Big Lost River basin, Idaho, is needed to (1) supply irrigation requirements during drought years, (2) provide increased flood control, and (3) insure more efficient use of the water supply available in normal years. Annual flow at Arco ranged from 0 to 195,500 acre-feet during the period 1944, 1947-68. Also, although an average of only about 7,000 acre-feet per year (10 cfs) passed the gage during the dry period 1960-64, the annual flow exceeded 100,000 acre-feet (138 cfs) in 5 years of the 23-year period 1944, 1947-68. An average annual flow of 55,900 acre-feet (77 cfs) left the basin during the period. Much of the water could be saved by prolonging the use of the storage space available in Mackay Reservoir, by construction of additional reservoirs, by increased diversion of upstream flows onto the Chilly-Barton Flats and thereby increasing the amount of water temporarily retained in the underlying aquifers, and by increasing irrigation efficiencies. (Knapp-USGS)
W71-07633

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME II, RESERVOIR REGULATION: SOME TECHNIQUES AND RESULTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06A.
W71-07060

AN APPROACH TO RESERVOIR TEMPERATURE ANALYSIS,
Corps of Engineers, Sacramento, Calif.
For primary bibliographic entry see Field 06A.
W71-07072

OPTIMAL POLICY FOR OPERATION OF A MULTIPURPOSE RESERVOIR,
Clemson Univ., S.C. Water Resources Research Inst.
B. J. Prochaska, and C. B. Russell.
Available from the National Technical Information Service as PB-198 520, $3.00 in paper copy, $0.95 in microfiche. Report No 18, Jan 1971. 54 p, 10 fig, 3 ref. OWRR Project A-018-SC (1).

Descriptors: *Mathematical models, *Optimization, *Dynamic programming, *Multipurpose reservoir, Reservoir management, *Reservoir operation, Operations research, Hydroelectric power, Statistical models, Economics, Inflow, Low-flow augmentation, Water level fluctuation.
Identifiers: Probabilistic dynamic programming, *Optimal control, Operating policy, Stochastic inputs, Optimal strategies, Auxilary power.

A mathematical model of a multipurpose reservoir is formulated taking into account such factors as: flow augmentation, the stochastic nature of inputs, requirements on the reservoir level, and the hydroelectric function of the reservoir. Based on the model an optimal solution to the problem of allocation of the impounded water is determined. These optimal polices or strategies are determined by (probabilistic) dynamic programming for which the objective is to minimize the expected total discounted cost over a finite horizon. These general results are in the form of theorems, some of which are represented graphically. A numerical example, to illustrate the results, and general implementation remarks are included.
W71-07133

OPTIMAL PLANS FOR CAPACITY EXPANSION OF WATER-SUPPLYING FACILITIES,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 06A.
W71-07134

WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA,
Arkansas Univ., Fayetteville. Water Resources Research Center.
L. R. Heiple, and H. M. Jeffus.
Available from the National Technical Information Service as PB-198 522, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Publication No 7, 1970. 149 p, 19 fig, 22 tab, 5 ref, 4 append. OWRR Project B-001-ARK (3).

Descriptors: *Flow rates, *Reservoir storage, Storage, Withdrawal, Distribution, *Planning, Arkansas, Oklahoma, *Interstate compacts.
Identifiers: Monthly fows, Flow frequency, Maximum storage, Maximum withdrawal.

The primary goal of this study was to review, analyze, and correlate previously collected hydrologic data for use by the Arkansas-Oklahoma Compact Committee in apportioning the joint water resource of the respective states. The objectives of this project included to determine stream discharge throughout the base period of study for all major watercourses flowing between the two states, a statistical review of the stream flows derived above to provide usable flow data based on various recurrence intervals, to consider conservation storage feasibility at various sites, and to review water quality, predict the effect of reservoir storage and the future use of these streams. The results included mean monthly flow data for gaging sites where major streams cross the Arkansas-Oklahoma state line, flow frequency studies of all gaging stations within the Compact area of interest, and the development of reservoir storage procedures which permit the sizing of reservoirs at a chosen stream location. (Babcock-Arkansas)
W71-07135

WATER RELATED LAND USE IN THE WEBER RIVER DRAINAGE AREA,
Utah Dept. of Natural Resources. Div. of Water Rights.
Frank W. Haws.
Utah State University, Logan, Water Research Laboratory Report PR-WG-40-4, Feb 1970. 79 fig, 50 tab.

Descriptors: *Maps, *Land use, *Water utilization, *Land classification, Vegetation, Crops, Watersheds (Basins), Utah, Water resources development, Planning, Drainage districts.
Identifiers: *Water related land use, *State water plans, Weber River Drainage Area.

In developing a state water plan, it is essential to know the amount of water depleted from a natural drainage basin through evaporation and transpiration. In order to estimate water loss, the types and amounts of crops produced, as well as types and amounts of non-crop vegetation, must be known. Using aerial photographs projected on a base map, as well as on-the-ground surveys, 29 types of water-related land use have been plotted, and many maps showing the amount and type of water-related land use are included. Tables give the number of acres per section under each type of land use. (Yensen-Arizona)
W71-07167

CONSIDERED LAKE ERIE-LAKE ONTARIO WATERWAY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 06B.
W71-07172

WATER-SEWER AND DRAINAGE PLAN FOR FORT SMITH URBANIZING AREA-PHASE II.
Arkhoma Regional Planning Commission, Fort Smith, Arkansas.
For primary bibliographic entry see Field 05D.
W71-07191

A STUDY OF STORM-WATER INLET CAPACITIES,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 08B.
W71-07199

WHAT'S AHEAD FOR OUR PUBLIC LANDS,
For primary bibliographic entry see Field 06E.
W71-07227

PRELIMINARY DESIGN REPORT, URBAN STORM DRAINAGE MODEL CITIES--DENVER.
Denver Dept. of Public Works, Colo.

Wright-McLaughlin Engineers Consultants report for Waste Water Control Division, Department of Public Works, City and County of Denver, Jan 1971. 2 tab, 3 fig, 26 dwg, append.

Descriptors: *Storm drains, Design data, Urbanization.
Identifiers: *Model cities, *Urban storm drainage, Denver.

The investigation of the urban storm drainage problems, the development of the goals and objectives for the area, and the planning of suitable solutions as presented in this report have been related to the overall urban system of Model Cities and the adjacent City and County of Denver. The summary and conclusions relative to the urban storm drainage system of Model Cities study areas A, C, D, and G are as follows: (1) Poor urban storm drainage systems have significantly contributed to the depressed nature of the neighborhoods; (2) Health, security and welfare of residents can be materially improved by bettering the drainage system; (3) Potential for improving the study areas appears to be great; (4) The 1985 land use map, prepared by the City in 1966, is a reasonable projection of future land uses and urban drainage planning; (5) The future degree of imperviousness and runoff coefficients were chosen on the basis of the 1985 map; (6) Selection of the design storm frequency for design of the major drainage system ranged from 25 to 100 years; (7) Goals and objectives developed using an environmental design team; (8) No allowance was made for a future roof top ponding ordinance; (9) Numerous auxilliary benefits have been identified; (10) Existing drainage problems are tabulated in detail; (11) Recommended solutions are included; (12) The design criteria utilized is based upon the Urban Storm Drainage Criteria Manual of the Denver Regional Council of Governments; (13) A strategy for financing and implementation has been developed; (14) Legal aspects are presented in the appendix. (Wray-Chicago)
W71-07307

ENVIRONMENTAL POLICY: NEW DIRECTIONS IN FEDERAL ACTION, RESTRUCTURING FOR COORDINATIVE POLICY AND ACTION,
Indiana Univ., Bloomington.
Lynton K. Caldwell.
Public Administration Review, Vol 28, No 4, p 301-303, July-Aug 1968.

Descriptors: *Environment, Decision making, Federal government, *Social aspects.
Identifiers: *Environmental policy, Federal participation, Coordinative policy, Public response.

The concept of public responsibility for the quality of the environment and for maintaining its viability has not yet become firmly embodied in the public law. Certain aspects of environmental policy have achieved statutory status through legislation on behalf of public health, conservation, or urban planning. Yet these and other measures do not cumulate to give us a basic political or constitutional doctrine that would guide social conduct as it impinges upon the environment. There is a growing body of evidence that indicates the emergence of a concept of public responsibility for the environmental welfare of the American people. Yet granting evidence of public concern, and accepting the scientific arguments of need for positive public action, the establishment of environmental administration as a major coordinative and managerial task of government will not be easily achieved. It is therefore important to the values of responsible popular government and constitutional procedures that goals and guidelines be as clearly stated as possible. Current developments in public administration that will facilitate innovation in management are: (1) team direction, (2) intellectual commitment to a total systems or ecological approach, (3) matrix concept of organization, (4) increasing interaction of private industrial and academic sectors of society with government in goal-directed public enterprises, (5) cybernetics, information service, and computer technology provide improved tools for environmental management. In the management of environment, it will be necessary to restructure the public agencies. (Wray-Chicago)
W71-07310

ENVIRONMENTAL MANAGEMENT: WATER AND RELATED LAND,
Water Resources Council, Washington, D.C.
Henry P. Caufield, Jr.
Public Administration Review, Vol 28, No 4, p 306-311, July-Aug 1968.

Descriptors: *Environment, Management, Resource development, Decision-making.
Identifiers: *Environmental problems, Public policy, Water resources planning.

The current concern for environmental quality requires a major intellectual and cultural revolution that would affect private and public decision making. It has called upon Congress to enact numerous specific pieces of legislation; and upon the Executive Branch, generally, to administer all ongoing programs with an eye on enhancement of environmental quality. Water and related land resources management is a major area within the total scope of the new environmental management. The Water Resources Planning Act is aimed at better organization, coordination, and support of comprehensive water and related land resources planning. The basic objective in federal formul tion of plans is to provide the best use of water an related land resources to meet all foreseeable sho and long term needs. The Planning Act created th Water Resources Council and the provision fo Federal-State River Basin Commissions. Bo groups are composed of experts in the field an representatives of the states and federal agencie involved. In hopes of promoting consensus, the A directs the presidentially appointed chairman to a as coordinator of the federal members and represent the federal government in federal sta relations on the commission. (Wray-Chicago)
W71-07311

ENVIRONMENTAL POLICY AND THE CO GRESS,
Senate, Washington, D.C.
Henry M. Jackson.
Public Administration Review, Vol 28, No 4, 303-305, July-Aug 1968.

Descriptors: *Federal government, Decision ma ing, Environment.
Identifiers: *Environmental policy, Coordinat research, Senate Bill 2805.

In considering the degradation of our natur resources, it is necessary to establish a relationsh to our environment in land, air, and water that w safeguard the physical and biological foundatio on which well-being, prosperity, and security re Three changes are needed to reorder our prioritie (1) more effective process of policy review on ma ters of environment; (2) more aggressive and coo dinated research on environmental problems a policies, (3) greater willingness by Congress to pr vide oversight on behalf of the public interest. spite of reluctance to increase federal spending environment when other expenditures are so hig Senate Bill 2805 calls for the establishment of a n tional program of environmental quality control, better organize the federal structure to deal with broad responsibilities. (Wray-Chicago)
W71-07312

FEDERAL POLICY PLANNING FOR TH MARINE ENVIRONMENT,
National Council on Marine Resources and E gineering Development, Washington, D.C.
Edward Wenk, Jr.
Public Administration Review, Vol 28, No 4, 312-320, July-Aug 1968. 1 tab.

Descriptors: *Federal government, Planni Coasts.
Identifiers: *Marine environment, Mari Resources and Engineering Development A Marine Science Council, Food-from-the-sea, Po development, Mapping the continental shelf.

The Marine Resources and Engineering Develo ment Act, passed in June 1966, was enunciated improve scientific understanding of the oceans, accelerate their exploration, and to assert a n tional consensus that untapped marine resourc should be developed to serve mankind's broad needs and aspirations. This paper is concerned wi the relationship of the marine environment to o national interests. In the Act, the President is giv responsibility to implement the legislation: developing a comprehensive program, by establi ing long-range studies, by clarifying responsibil where missions cross agency lines, and by evalu ing the government's program annually. To adv and assist the President are the National Council Marine Resources and Engineering Developme plus a professional staff. Specific areas of conce by the Marine Science Council include (1) expa sion of international cooperation in ocean explo tion, (2) intensification of food-from-the-sea efforts, (3) fostering rational development of t coastal zone, (4) preparation for new programs port development, (5) insuring the safety of and property along the coasts, (6) increasing grant program investments, (7) fostering mar applications of new technology, (8) intensificati

work in deep ocean technology, (9) increasing
ctic and subpolar research, (10) encouragement
international regional cooperation, (11) con-
uation of mapping the continental shelf. (Wray-
icago)
71-07313

**VIRONMENTAL MANAGEMENT AND THE
PARTMENT OF THE INTERIOR,**
partment of the Interior, Washington, D.C.
nley A. Cain.
blic Administration Review, Vol 28, No 4, p
0-326, July-Aug 1968.

scriptors: *Environment, *Management, Natu-
Resources, Ecology, Conservation, Federal
vernment, Decision-making.
ntifiers: *Department of the Interior, Resource
licy, Government agencies.

is paper looks at government response to en-
onmental problems, especially by the Depart-
nt of the Interior. Terms, such as environment,
tural resources, human resources, ecology, and
nservation are defined. The Department of the
erior is described as a sprawling organization
h so many statutory missions that it can do no
re than suggest programs for environmental
nagement. The National Park System and Bu-
u of Sport Fisheries and Wildlife have had tre-
ndous influence on public concern for conserva-
n and the destructive processes affecting our en-
onment. The Bureaus of Outdoor Recreation, of
mmercial Fisheries, and of Land Management
clearly and properly orientated to human
eds. The Bureau of Indian Affairs and Office of
rritories are similar in that they assist in the
nagement of land and water resources, but differ
that the human interests are principally those of
residents. The Geological Survey and Bureau of
nes are aimed at minimizing ecological
turbances while providing maximum goods and
vices to the nation. The Bonneville Power Ad-
nistration markets power from federal
droelectric projects in the Pacific northwest, and
concerned with the physical and social effects of
program. The Bureau of Reclamation does
earch to aid development and conservation of
ter resources. The Office of Water Resources
search seeks to stimulate, sponsor, and supple-
nt present programs of research and training in
field of water. The difficulty in defining goals
the Department of the Interior is determining
ich goals have priority. A promising solution for
ra-departmental conflicts is more widely based
nning sessions with members from various agen-
s. (Wray-Chicago)
71-07314

**TABLISHMENT OF A DEEP-SEA TER-
NAL OFF THE TEXAS GULF COAST,**
uth Texas Regional Export Expansion Council.
y R. Brimble.
ater Spectrum, Army Corps of Engineers, p 10-
, Spring 1971.

scriptors: *Harbors, Transportation, Port
thorities.
ntifiers: *Deep-sea terminal, International
de, Superships, Texas Gulf Coast.

xas port leaders have decided to explore the
sibility of a gulf offshore terminal believing that
ch a facility would greatly benefit Texas ports, in-
stries, and consumers. Advocates for construc-
n of deep-sea terminals feel the construction is
evitable if the economic benefits for U.S. con-
mers and industries in the future are to be
thcoming. Due to their immense size, supertan-
rs dictate immediate economic benefits to ship-
rs and consumers. Areas unable to accommodate
ep draft vessels will be deprived of such service
d goods. In addition to generating a substantial
w of income and employment to deep-port areas
and out of the U.S., the intermediate and end
oducts created will compete with similar U.S.
oducts. Generally, lower initial costs due to volume transportation will give foreign products a decided advantage in world markets. Opponents of deep-sea terminals present evidence composed of historical research, financial dislocations, and lack of need. They also fear Federal control. The advocates, however, point out that there is great evidence supporting the need for deep-sea terminals off the Texas Gulf Coast. Cheap transportation of petroleum, iron ores, and bauxite is vital for international trade competition. The Texas Gulf Coast area is suggested as the most suitable for developing these terminals. (Wray-Chicago)
W71-07318

THE CASE AGAINST FEDERAL DEVELOPMENT OF REGIONAL PORTS,
American Association of Port Authorities.
Alfred Hammon.
Water Spectrum, Army Corps of Engineers, p 7-9, Spring 1971.

Descriptors: *Harbors, Port authorities.
Identifiers: *Ports and harbors, Superships, Federal and local involvement, American Association of Port Authorities, National Capability Study.

The public port industry through the American Association of Port Authorities (AAPA) in September 1970, completed a report titled the 'National Channel Capability Study.' The goal of the study was to understand the trend toward such superships and to survey the interests and plans of U.S. public port agencies to accommodate them in the next 30 years. Individual port responses and regional or coastal assessments within as well as outside of the AAPA study effort indicate that 40 out of 50 ports considered Federal regional port development unnecessary, undesirable and thus unwanted. The public port agencies in the U.S. are traditionally state, county, or municipal, and they pride themselves in avoiding Federal aid and securing private investment. They suspect that a Federal port scheme could seriously disrupt local port investment. Also, smaller ports see no future involvement in the supership problem, and thus have more to lose than to gain from expanded Federal port activity. Indeed, all ports have a major fear that commencement of Federal regional port development studies will bring about the termination of specifically authorized channel improvement study, construction, and maintenance projects urgently needed to fill more immediate or shorter term requirements. The need for, interest in and support for Federal approaches to regional port development by the public port industry thus is narrowed to those very few instances in which supership size pressures are such that can only be met through improvements to existing channels at a clearly unreasonable cost. The National Channel Capability Study has established that the supership problem is essentially confined to bulk cargoes and relatively few ports. (Wray-Chicago)
W71-07319

STOCHASTIC SIMULATION OF MONTHLY STREAMFLOW BY A MULTIPLE REGRESSION MODEL UTILIZING PRECIPITATION DATA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 02A.
W71-07334

FLOATING VEGETATION OF LAKE KAINJI, NIGERIA,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
A. M. A. Imevbore.
Nature, Vol 230, No 5296, p 599-600, Apr 30, 1971. 2 p, 11 ref.

Descriptors: *Aquatic drift, *Lakes, *Floating, *Vegetation, *Aquatic weeds, Weed control, Plants.
Identifiers: *Lake Kainji (Nigeria), *Africa, Pistia stratiotes.

Fears that Lake Kainji in Nigeria would become infested with the water weed Pistia stratiotes have not been borne out by recent events. This manmade lake now seems to be free of weed, in contrast to similar lakes elsewhere. Pistia and other potential weed could not form extensive mats at Kainji for two main reasons. First 70% of lake surface was cleared of vegetation and burnt before impoundment, which not only reduced the initial nutrient enrichment of the water but also retarded the growth of plants which would otherwise have been rapid within the quiet and stagnant water between trees standing in the lake. Frequent and regular winds also tended to destroy any mats which had formed. The most important reason is the hydrology of the lake. The ratio of outflow to volume of the lake is 4.1. Its mean retention time (capacity/inflow) has been calculated as 76 days. This means that the whole lake water is changed about four times per year. (Woodard-USGS)
W71-07602

OPERATIONAL HYDROLOGY FOR UNGAGED STREAMS BY THE GRID SQUARE TECHNIQUE,
Department of Energy, Mines, and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 02E.
W71-07622

STREAM CHANNELS AND FLOW RELATIONS,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 02E.
W71-07624

CONSIDERATIONS FOR WATER USE AND MANAGEMENT IN THE BIG LOST RIVER BASIN, IDAHO; A SUPPLEMENTAL REPORT,
Geological Survey, Boise, Idaho. Water Resources Div.
For primary bibliographic entry see Field 03F.
W71-07633

A METHOD FOR FORECASTING SPRING RUNOFF FROM RIVERS IN THE DNIESTER BASIN (METODIKA PROGNOZA VESENNEGO STOKA REK BASSEYNA DNESTRA),
For primary bibliographic entry see Field 02E.
W71-07651

FOREST INFLUENCE ON RIVER FLOWS,
State Hydrological Inst., Leningrad (USSR).
A. P. Bochkov.
Extract from Proc 3rd All-Union Hydrological Congress, Vol 2, p 11-17, Hydrometeorological Pub House, 1959. Nature and Resources, Bulletin of the International Hydrological Decade, Vol 6, No 1, p 10-11, March 1970. 2 p, 1 fig.

Descriptors: *Vegetation effects, *Forests, *River flow, International Hydrological Decade, Hydrogeology, Soil-water-plant relationships, Runoff, Rainfall-runoff relationships, Infiltration, Groundwater movement, Surface-groundwater relationships.
Identifiers: European part of the USSR.

Data on more than 200 river basins of the European part of the USSR are used in graphs to show relations between average annual flow and the percentage of forest cover in different areas under conditions of average annual precipitation; relations between average annual flow and degree of latitude in regions with the same average precipitation; and relations between the percentage of forest cover and degree of latitude in regions with the same average precipitation. (Woodard-USGS)
W71-07689

4B. Groundwater Management

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 03B.
W71-07064

ANALYSIS AND EVALUATION OF PUMPING TEST DATA,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands); and Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02F.
W71-07166

SUBSIDENCE RESULTING FROM THE REMOVAL OF GROUNDWATERS,
For primary bibliographic entry see Field 06E.
W71-07209

WATER FOR THE FUTURE OF LONG ISLAND, NEW YORK,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 06B.
W71-07293

DYNAMIC PROGRAMMING FOR CONJUNCTIVE WATER USE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and California Univ., Davis. Dept. of Water Science and Civil Engineering.
Gert Aron, and Verne H. Scott.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY 5, Paper 8145, p 705-721, May 1971. 17 p, 8 fig, 2 tab, 10 ref, append.

Descriptors: *Dynamic programming, *Conjunctive use, *Optimization, Systems analysis, Water resources development, Recharge, Reservoirs, Aquifers, Planning.

Dynamic programming may be used to optimize the conservation and use of a conjunctive system of ground and surface waters involving several surface reservoirs, streams, recharge facilities, distribution pipelines, and aquifers. This complex system should be divided into several smaller and simpler subsystems. Wherever the interdependence of the subsystems is relatively small, the operations are optimized independently. The result is a system of a small number of state and decision variables with predetermined internal operative rules, which is then subjected to a conjunctive optimization. The method is applied to a water-allocation system to produce an optimal policy for 8 yr of operation in 3-month intervals. (Knapp-USGS)
W71-07616

DRILLER'S HANDBOOK NO. 1,
Petroleum Publishing Co., Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W71-07683

DRILLER'S HANDBOOK NO. 2,
Petroleum Publishing Co., Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W71-07684

INTERPRETATION OF GEOPHYSICAL LOG IN BORES IN UNCONSOLIDATED SEDIMENTS, PHASE I,
Australian Water Resources Council, Sydney.
D. W. Emerson, and S. S. Webster.
Australian Water Resources Council, Research Project 68/7, Feb 1970 (Preliminary Edition). 211 p. Research Project 68/7, Phase I.

Descriptors: *Logging (Recording), *Water wells, Electrical logging, Radioactive logging, Groundwater, Hydrogeology, Borehole geophysics.
Identifiers: *Australia, *Groundwater investigations, Unconsolidated sediments, Practical quantitative analysis procedure, Calibration practices log interpretation procedures, Digital data acquisition.

This report covers the first phase of a two-phase project to investigate the interpretation of geophysical logs of water wells in unconsolidated sediments. Phase I of the project was designed to (1) appraise the well logging practices presently in use for groundwater investigation in Australia, (2) evaluate the geophysical well logging method in its application to unconsolidated sediments, (3) interpret selected well logs to estimate the possibility of this research project producing a practical quantitative analysis procedure. The investigation (1) above showed that the well logging practices are inadequate for a full evaluation of aquifers. A chapter concerning the standarization of gamma-ray logging is included. Present data presentation formats and radiation intensity units are shown to have little uniformity throughout Australia, while calibration practices are inadequate for the provision of accurate logs. Procedures to eliminate these deficiencies are outlined. A digital approach to data acquisition, storage and interpretation is discussed together with the description of an inexpensive, but efficient, magnetic tape recording system. Aquifer water salinity-resistivity relationships are analysed as are other aquifer parameters important to well log interpretations. The interpretation techniques employed in this report, though efficient, are provisional and should be expanded and improved during phase II of the research project. (Campbell-NWWA)
W71-07685

QUANTITATIVE WATER RESOURCE BASIN PLANNING: AN ANALYSIS OF THE PECOS RIVER BASIN, NEW MEXICO,
New Mexico Univ., Albuquerque. Dept. of Economics.
Ralph C. d'Arge.
WRRI Report No 8, Water Resources Research Institue, New Mexico State University, Las Cruces, 1970. 104 p, 6 fig, 69 tab, 43 ref, 10 append. OWRR Projects B-006-N MEX (2) and B-001-N MEX (2).

Descriptors: *Water allocation (Policy), *Water analysis, *Project planning, *Groundwater, *Linear programming, Water transfer, Constraints, Water users, New Mexico.
Identifiers: *Pecos River Basin.

An attempt to identify explicit policy choices for time-related reallocation of water resources within the Pecos River Basin in New Mexico was made. It was viewed as a 'closed water system' where a substantial amount of the basin's resources could be exhausted through runoff, evaporation, evapotranspiration, and groundwater mining. The report contained two major parts including a set of water requirements projections for major industrial, agricultural, and commercial water-using sectors in the Pecos Basin Five County Area (PBFCA) for the years 1980 and 2000, and an analysis of potential for intra-basin water transfers within the Pecos River Basin drainage area in New Mexico. Requirements projections developed in the first section were utilized as data inputs for the water transfer model developed in the second section. This model was of the linear programming type, containing an explicit objective function and a set of contraints on water-related activities. The initial planning objective was to reallocate existing stock and flow water sources between competitive users so as to maximize value added (gross output) of the Pecos Basin. Preliminary tests were made and results were given. Appendices gave specifics of the requirements projections. (Kriss-Cornell)
W71-07691

4C. Effects on Water of Man's Non-Water Activities

OPSET: PROGRAM FOR COMPUTERIZED SELECTION OF WATERSHED PARAMETER VALUES FOR THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07061

THE STANFORD WATERSHED MODEL: THE CORRELATION OF PARAMETER VALUES SELECTED BY A COMPUTERIZED PROCEDURE WITH MEASURABLE PHYSICAL CHARACTERISTICS OF THE WATERSHED,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07062

URBAN HYDROLOGY, HOUSTON METROPOLITAN AREA, TEXAS - 1968,
Geological Survey, Houston, Tex.
S. L. Johnson.
Geological Survey Data Report, 1970. 302 p, 14 fig, 14 tab, 6 ref.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Hydrologic data, *Urbanization, *Texas, Stream gages, Storm runoff, Peak discharge, Low flow, Average flow, Hydrographs, Mass curves, Cities, Data collections.
Identifiers: *Urban hydrology, Houston (Tex).

The Houston study area, centered about 45 miles from the Gulf of Mexico, is within a 1,000-square-mile area of land surface that increases in altitude from 35 feet above mean sea level in the southeast to 135 feet in the northwest. Records presented for the water year 1968 (October 1967-September 1968) include daily discharges at 33 continuous streamflow stations, annual maximum discharge at crest-stage partial-record stations, and daily rainfall from recording and nonrecording rain gages located at continuous streamflow stations and miscellaneous sites. Also included are individual storm analyses which show a mass curve for rainfall over a basin and mass curve and hydrograph of discharge from the basin, for those basins which are instrumented for more detailed study of rainfall and its relation to runoff. Average rainfall over the Houston metropolitan area during the 1968 water year was 51 inches, or 5 inches greater than the 30-year (1931-60) average for the Houston airport station. Two area-wide storms and one localized storm of unusual magnitude occurred during the year. (Woodard-USGS)
W71-07184

INFORMATION FOR THE FUTURE: THE WEST SIDE SAN JOAQUIN VALLEY PROJECT.
California Univ., Los Angeles. Water Resources Center.
For primary bibliographic entry see Field 06B.
W71-07241

THE EFFECTS OF URBAN DRAINAGE ON LAKE McILWAINE, RHODESIA,
For primary bibliographic entry see Field 05C.
W71-07524

CONFLICTS ARISING FROM THE USE OF SHORE PROPERTY ON THE GREAT LAKES,
Department of Public Works, Toronto (Ontario).
D. W. Quinlan.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 145-154, 1968.

escriptors: *Great Lakes, *Land use, *Planning, Conservation, Zoning, Taxes, Government, Flood lain, Scarcity, Cost-benefit analysis, Agriculture, ptimization, Investment.
dentifiers: *Urbanization, *Industrialization, ommercial-industrial development.

onflicts are presented that exist between shore roperty users along the ten thousand miles of horeline within the Great Lakes Basin. The mul-plicity of users, each with its own peculiar equirements, is cited as the underlying cause for ch conflict. Specific conflicts dealt with include ose between urbanization and open land use, etween agricultural and industrial use, and etween commercial-industrial development and ecreational needs. One problem directly con-ected to land use planning is the haphazard evelopment which has been allowed in the flood ain. The rapid development of the shoreline area cited as the cause of various economic difficulties hich resulted in the need for increasing amounts tax monies for resolution or alleviation of the dif-culties. Improved land use planning and zoning is roposed to maintain a semblance of order for the o-existence of each interest and the maximum ood of all interests, before the loss of the remain-g open land around the Lakes can occur. (See so W71-07565) (Murphy-Rutgers)
/71-07571

D. Watershed Protection

ROSION RATES IN THE STEVEVILLE ADLANDS, ALBERTA,
lberta Univ., Edmonton.
or primary bibliographic entry see Field 02J.
/71-07165

URNING POINTS IN TIME--AND/WATER/PEOPLE.
or primary bibliographic entry see Field 03F.
/71-07294

5. WATER QUALITY MANAGEMENT AND PROTECTION

A. Identification of Pollutants

VALUATION OF PYRITIC OXIDATION BY UCLEAR METHODS,
arnegie-Mellon Univ., Pittsburgh, Pa.
obert A. Baker.
opy available from GPO, Sup Doc as SOD order o EP 2.10:14010F1103/71, $0.50; microfiche om NTIS as PB-198 523, $0.95. EPA-WQO Vater Pollution Control Research Report, Mar 971. 31 p, 11 fig, 5 tab, 11 ref. EPA-WQO Pro-ram 14010 FII.

escriptors: *Mine drainage, Water pollution ources, Coal mines, Mine wastes, Spectroscopy, nalytical techniques, Mine acids, Acid mine ater, Cobalt radioisotopes, Pyrite, Iron, Gamma ays.
dentifiers: *Moessbauer effect, *Backscatter de-ection, Iron-57, Cobalt-57, Nuclear resonance bosorption.

aboratory studies demonstrated the feasibility of sing the Mossbauer effect and a backscattering ode of detecting 14.4 Kev gamma rays to spectro-copically monitor the oxidation processes taking lace on pyrite materials. A cobaltous oxide form f cobalt-57 was the radiation source. Spectra were btained of pyritic surfaces under 2 mm of water. ifferentiation of nonoxidized and oxidized pyritic rfaces was possible with further separation of the pectra to show individual oxidation product peaks uggesting ferric hydroxide and ferric sulfate.
/71-07137

PESTICIDES IN HATCHERY TROUT--DIFFERENCES BETWEEN SPECIES AND RESIDUE LEVELS OCCURRING IN COMMERCIAL FISH FOOD,
Pennsylvania State Univ., University Park. Pesticide Research Labs.
H. Cole, A. Bradford, D. Barry, P. Baumgarner, and D. E. H. Frear.
Pesticides Monitoring Journal, Vol 1, No 2, p 35-37, 1967. 2 tab, 4 ref.

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, DDT, Dieldrin, Heptachlor, Fish diets, Fish management, Brook trout, Brown trout, Rainbow trout, Gas chromatography, Analytical techniques.
Identifiers: *Fish foods, DDD, DDE, Heptachlor epoxide.

Samples of commercial fish food from four manufacturers and trout of three species, brook, brown and rainbow, were analyzed for persistent chlorinated pesticides. The trout were in the 8 to 9 inch size range at the time of analysis. Small quantities of heptachlor, heptachlor epoxide, dieldrin, DDE, DDT (TDE), o,p'-DDT, and p,p'-DDT were found in the fish food. One source contained all of the pesticides except DDD. The trout were analyzed on the basis of chloroform-methanol extractable lipids from the whole fish. The rainbow trout with one exception contained all seven pesticides. The rainbow trout contained greater quantities of all pesticides than the brook or brown trout. The brown trout contained significantly more heptachlor, heptachlor epoxide, dieldrin, DDE and DDD than the brook trout. (Sjolseth-Washington)
W71-07141

CHLORINATED PESTICIDE RESIDUES IN AN AQUATIC ENVIRONMENT LOCATED ADJACENT TO A COMMERCIAL ORCHARD,
Wisconsin Dept. of Agriculture, Madison.
R. J. Moubry, J. M. Helm, and G. R. Myrdal.
Pesticides Monitoring Journal, Vol 1, No 4, p 27-29, 1968. 4 tab, 4 ref.

Descriptors: *Pesticide residues, *DDT, *Dieldrin, *Endrin, *Aquatic environment, Chlorinated hydrocarbon pesticides, Gas chromatography, Benthic fauna, Bottom sediments, On-site investigations, Wisconsin, Silts, Orchards, Surface runoff, Caddis flies, Brook trout.
Identifiers: *Bottom organic matter, *Tissue analysis, DDD, DDE, Knight's Creek Wisconsin.

Samples of water, silt, bottom organic debris, bottom organisms and fish were collected from an aquatic environment (Knight's Creek, Wisconsin) located adjacent to a commercial orchard previously treated with endrin, dieldrin and DDT. Residue data obtained from the analysis of these samples are presented. The results obtained indicate that contamination of the environment studies was minimal. (Sjolseth-Washington)
W71-07142

MERCURY DETERMINATION IN FISH SAMPLES BY WET DIGESTION AND FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. F. Uthe, F. A. J. Armstrong, and M. P. Stainton.
Journal of the Fisheries Research Board of Canada, Vol 27, No 4, p 805-811, 1970. 6 fig, 5 ref.

Descriptors: *Spectrophotometry, *Test procedures, Analytical techniques, Heavy metals, Laboratory tests, Laboratory equipment.
Identifiers: *Mercury, Wet digestion, Tissue analyses.

A simple, rapid method is given for determination in fish of mercury at concentrations measured in parts per million (ppm). Samples are digested at 50-60 C with sulphuric acid and oxidized with permanganate. Mercury in the digest is determined by atomic absorption spectrophotometry. Recovery of mercury added to samples was complete, with good precision. Standard deviations from triplicate analyses were plus or minus 0.039 at the 0.1 ppm level and plus or minus 0.051 at the 0.5 ppm level. In a day, three workers analyzed 15-20 samples in triplicate. (Sjolseth-Washington)
W71-07148

IDENTIFICATION OF PETROLEUM PRODUCTS IN WATER,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
Adrian Demayo.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch Technical Bulletin No 32, 1970. 22 p, 14 fig, 14 ref.

Descriptors: *Pollutant identification, *Oily water, *Laboratory tests, *Gas chromatography, Test procedures, Oil gasoline, Water pollution, Analytical techniques, Instrumentation.
Identifiers: *Oil spills.

This report describes an extraction method used to analyze water samples, and activated carbon samples through which water has been passed, for the presence of crude oil or other petroleum products. The chromatogram of a mixture of a series of hydrocarbons which was used to check the performance of the gas chromatographic system at various times is presented. The performance of the method was constant over the period of time during which this work was carried out. The chromatogram of a diesel oil and that of a gasoline are very different in their patterns. The range of carbon number is also different; in gasoline it ranges from C6 to C11 while in a diesel oil the range is from C10 to C18. (Woodard-USGS)
W71-07240

THE USE OF ULTRA-VIOLET ABSORPTION MEASUREMENTS FOR THE ESTIMATION OF ORGANIC POLLUTION IN INSHORE SEA WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and A. W. Morris.
Water Research, Vol 5, No 1, p 19-27, Jan 1971. 9 p, 7 fig, 7 ref.

Descriptors: *Pollutant identification, *Organic matter, *Sea water, *Spectrophotometry, Ultraviolet radiation, Analytical techniques, Spectroscopy.
Identifiers: *Ultraviolet absorption spectroscopy.

Changes in the ultraviolet absorption spectra of sea water at an inshore station were monitored. These changes were interpreted in terms of variable supply of organic matter from the major sources of land drainage and autochthonous biological activity. Differences in the molecular nature of the organic matter derived from these sources result in seasonal variations in both the degree of absorption per unit of dissolved organic carbon and the relative absorption within different wavelength regions. Hence, only a poor correlation was obtained between the ultraviolet absorption and the dissolved organic carbon content. Appreciable short term variations in spectra were also recorded. These variations severely limit the use of ultraviolet absorbance measurements for the indication of marine organic pollution. (Knapp-USGS)
W71-07256

AN IMPROVED DIANTHRIMIDE TECHNIQUE FOR THE DETERMINATION OF BORON IN RIVER WATERS,
Calgary Univ. (Alberta). Dept. of Geology.
A. A. Levinson.
Water Research, Vol 5, No 1, p 41-42, Jan 1971. 2 p, 6 ref. Canada National Research Council Grant A4383.

Descriptors: *Pollutant identification, *Boron, *Surface waters, *Analytical techniques,

*Colorimetry, Water analysis, Salinity, Water chemistry.
Identifiers: *Boron determination.

A modified dianthrimide method is described which is capable of detecting as little as 0.01 mg per liter boron in river water. The procedure is based upon the use of calcium hydroxide to fix the boron; this also permits rapid evaporation of the water sample without the loss of volatile borates. (Knapp-USGS)
W71-07257

IMPROVED CHEMICAL OXYGEN DEMAND APPARATUS,
Montgomery Research, Inc., Pasadena, Calif.
R. J. TeKippe, and R. G. Zehnpfennig.
Journal Water Pollution Control Federation, Vol 43, No 3, Part 1, p 515-518, Mar 1971. 4 p, 2 fig, 1 ref.

Descriptors: *Water analysis, *Oxygen demand, *Chemical oxygen demand, *Chemical analysis, Equipment, Instrumentation, Dissolved oxygen.
Identifiers: *Chemical oxygen demand tests.

The conventional chemical oxygen demand test method, although becoming more popular than the 5-day biochemical oxygen demand test, still suffers from inconveniences inherent in the use of water-cooled condensers. Air-cooled condensers perform equally well, and with suitable timers can be operated automatically. The unit described has been in operation for over 6 yr and has proven satisfactory in every respect. (Knapp-USGS)
W71-07259

AVERAGE DISSOLVED OXYGEN--MEASUREMENT AND WATER QUALITY SIGNIFICANCE,
Geological Survey, Menlo, Calif.
Keith V. Slack.
Journal Water Pollution Control Federation, Vol 43, No 3, Part 1, p 433-446, Mar 1971. 14 p, 5 fig, 3 tab, 41 ref.

Descriptors: *Dissolved oxygen, *Water analysis, Reviews, Analytical techniques, Water quality, Diurnal, Monitoring, Surveys, Diffusion, Osmosis.
Identifiers: *Dissolved oxygen measurement.

Available methods of obtaining dissolved oxygen (DO) data at water quality network stations have limitations of high cost, inconvenience of sampling for diel changes, or inadequacy of data for comparative purposes. The diel average DO concentration is better than a single daytime measurement for comparing DO conditions at different stations. Simple devices called DO integrators were developed for determining average DO concentration. The integrators are closed containers filled with water that contacts the environment through semipermeable diffusion barriers. Molecular oxygen diffuses through the barriers until oxygen pressures inside and outside the containers are equal. Diurnal and other short-period fluctuations in DO are smoothed out, and thus the integrator DO concentration is the average DO of the environment. Average DO concentrations, combined with measurements of instantaneous DO in late afternoon, provide a basis for estimating the nighttime extreme DO concentration. (Knapp-USGS)
W71-07260

DETERMINATION OF METHYLMERCURY SALTS IN VARIOUS KINDS OF BIOLOGICAL MATERIALS,
National Inst. of Public Health, Stockholm (Sweden).
Gunnel Westoo.
Acta Chemica Scandinavica, Vol 22, No 7, p 2277-2280, 1968. 5 ref.

Descriptors: *Heavy metals, Metals, Fish, *Analytical techniques, *Chemical analysis, Physicochemical properties, Water pollution, Bottom sediments, Benthic fauna, Benthos, Laboratory tests, Waste identification, *Pollutant identification.
Identifiers: Mercury, *Mercury pollution.

The cysteine acetate modification of the method for determining methylmercury salts in foods, which was useful for analysis of fish, egg white, and meat, was not efficient when applied to egg yolk with low methylmercury content, liver, sediments in aquaria, or sludge. Therefore some modifications of the procedure have been investigated. A combination of the mercuric chloride and cysteine acetate procedures gave good results for sediments in aquaria and sludge and could also be used for, e.g., fish, egg white, bile, kidney, blood, meat, and moss. Precipitation of the proteins with molybdic acid at the first extraction improved the results for liver but not for egg yolk. For egg yolk an increase of the concentration of the cysteine acetate solution from 1 to 10% gave 90% recovery of added methyl mercury, repeated extractions 100% recovery. (Novotny-Vanderbilt)
W71-07322

DETERMINATION OF METHYLMERCURY COMPOUNDS IN FOODSTUFFS, II. DETERMINATION OF METHYLMERCURY IN FISH, EGG, MEAT, AND LIVER,
National Inst. of Public Health, Stockholm (Sweden).
Gunnel Westoo.
Acta Chemica Scandinavica, Vol 21, No 7, p 1790-1800, 1967. 2 fig, 4 tab, 8 ref.

Descriptors: *Heavy metals, *Analytical techniques, Fish, Biochemistry, Organic compounds, Gas chromatography, Chemical analysis, Carbohydrates, Water pollution, Pollutant identification.
Identifiers: Mercury, *Mercury pollution, *Methylmercury.

The combined gas chromatographic and thin-layer chromatographic method for the identification and determination of methylmercury compounds in fish has been modified in order to render it applicable to a wider range of foods. In animal foodstuffs methylmercury is probably to a great extent attached to thiol groups. When these foods are extracted methylmercury chloride is formed and dissolves in the benzene together with varying amounts of thio compounds. Purification of the methylmercury in the benzene extracts of, e.g., egg yolk or liver by extraction with aqueous alkali solution did not work, probably because the thio compounds were not volatile and could form alkali-insoluble methylmercury salts. Evidently methylmercury-S-compounds were reformed at high pH and prevented the formation of the water-soluble methylmercury hydroxide. Addition of excess mercuric ions, which expelled the methylmercury from the thio compounds solved this clean-up problem. Samples of fish, egg-white, egg yolk, meat, and liver have been analyzed with the modified method. Extraction of the methylmercury into an aqueous phase was also possible with the aid of a water solution of cysteine. This led to a more rapid analytical procedure. (Novotny-Vanderbilt)
W71-07323

MERCURY ANALYSIS IN BIOLOGICAL MATERIAL BY DIRECT COMBUSTION IN OXYGEN AND PHOTOMETRIC DETERMINATION OF THE MERCURY VAPOUR,
Statens Provningsanstalt, Stockholm (Sweden).
V. Lidums, and U. Ulfvarson.
Acta Chemica Scandinavica, Vol 22, No 7, 1968, p 2150-2156.

Descriptors: *Heavy metals, *Analytical techniques, Metals, Biochemistry, Chemical analysis, Physicochemical properties, Laboratory tests, Waste identification, Biomass, Photometry, *Pollutant identification.
Identifiers: Mercury, *Mercury pollution.

Mercury in small quantities in, for example, biol
ic material is determined by direct combustion
oxygen of samples weighing between 20 and 2
mg. The combustion gases are passed through c
ferent zones under temperature conditions ca
fully controlled to allow complete oxidation of
ganic material, but also to avoid the formation
mercury oxide. The mercury is temporarily c
lected on a gold filter. When all combusti
products have passed through the system the m
cury absorbed on the gold is released by heati
and the mercury vapour is determined photome
cally by means of ultraviolet light absorption
253.7 nm. The reproducibility of the method
good; the difference between duplicate analyse
mostly less than 10%. Samples containing abou
ng of mercury per g may be analysed without d
ficulties. (Novotny-Vanderbilt)
W71-07327

**A NEW AUTOMATIC DETERMINATION
OXYGEN IN ORGANIC SUBSTANCES
COLORIMETRIC TITRATION, (IN GERMAN**
Badische Anilin- und Soda-Fabrik A.G., L
wigshafen am Rhein (West Germany).
Wolfgang Merz.
Analytica Chimica Acta, Vol 51, No 3, p 523-5
1970. 1 fig, 5 ref.

Descriptors: *Colorimetry, *Analytical techniqu
*Oxygen, *Organic matter, Measurement, Vo
metric analysis, Automation.
Identifiers: Carbonic acid.

The introduced assembly for automatic determi
tion of oxygen in organic substances utili
colorimetric titration of carbonic acid. The time
a complete analysis of one sample varies betwe
14 and 18 minutes. In routine analyses appro
mately 40 determinations are made per worki
day. Employment of an electronic scanner w
corresponding counter would appreciably incre
the efficiency of the assembly. (Wilde-Wisconsin
W71-07349

**PHOTOSYNTHETIC COEFFICIENT AS
FUNCTION OF THE COMPOSITION
PLANT BIOMASS, (IN RUSSIAN),**
Institut Mediko-Biologicheskikh Problem, Mosc
(USSR).
For primary bibliographic entry see Field 05C.
W71-07359

**A NEW REAGENT FOR THE DETECTION A
DETERMINATION OF SMALL AMOUNTS
THE SULPHATE ION,**
Birmingham Univ. (England). Dept. of Chemistr
William I. Stephen
Analytica Chimica Acta, Vol 50, No 3, p 413-4
June 1970. 2 fig, 1 tab, 6 ref.

Descriptors: *Sulfates, Analytical techniqu
Chemical precipitation, Sulfur, Organic co
pounds, Ions, Sulfur, Oil.
Identifiers: *2-aminoperimidine hydrochloride,
agents.

An aqueous solution of 2-aminoperimidi
hydrochloride is proposed as a new reagent for
detection and determination of the sulphate ion.
little as 0.05 p.p.m. can be detected by precipi
tion of the corresponding amine sulphate. Susp
sions of the precipitate show remarkable stabil
and no colloidal stabilizers are needed. The reag
is applied to the nephelometric determination
0.1-5 p.p.m. of sulphate ion; at the 0.5 p.p.m. le
the relative standard deviation is 4.5 perce
Although many ions form precipitates with the
agent at high concentrations, very few of the co
mon anions provide significant interference in
nephelometric determination. The reagent see
promising for the determination of sulphate
natural waters, and for traces of sulfur in orga
compounds such as hydrocarbon oils after oxyg
flask combustion. (McCann-Battelle)
W71-07385

MUNOFLUORESCENT IDENTIFICATION TYPE 12 GROUP A STREPTOCOCCI,
w York State Dept. of Health, Albany. Div. of s. and Research, and Connecticut State Dept. Health, Hartford. Lab. Div.
liam F. Vincent, Kathleen J. Lisiewski, and liam W. Ullmann.
plied Microbiology, Vol 20, No 4, p 590-592, 1970. 3 tab, 8 ref.

scriptors: *Streptococcus, *Cultures, *Pollutant ntification, Diolysis, Analytical techniques, man disease, Public health.
ntifiers: *Fluorescent antibody staining, rotyping, Streptococcus pyogenes type 12, uelae.

orescent antibody (FA) staining techniques e applied successfully to the serotyping of type streptococci. The FA conjugate prepared by eling streptococcal M type 12 antibody with rescein isothiocyanate was found to exhibit siderable nonspecific FA staining with other up A M-serotypes. The cross-reactions could be uced sufficiently or eliminated by the addition dsorbed homologous blocking serum (AHB) not by preimmune serum. The AHB was pared by adsorbing type 12 antiserum with un-ted homologous cells. Comparative straining unblocked and AHB-blocked FA conjugates bled type 12 streptococci from clinical cimens to be rapidly and accurately identified. nature of the serum constituents responsible blocking is not known but is assumed to be an-dy to certain common antigens shared by the ptococci. (Mortland-Battelle)
1-07386

FECTS OF ALKYLBENZENE SULFONATES YEASTS,
rgia State Univ., Atlanta. Center for Disease ntrol.
. Standard, and D. G. Ahearn.
plied Microbiology, Vol 20, No 4, p 646-648, 1970. 1 fig, 3 tab, 8 ref.

scriptors: *Yeasts, *Alkylbenzene sulfonates, tergents, Industrial wastes, Sewage, Surfac-s.
ntifiers: Hansenula, Candida.

tain strains of two yeast species (Hansenula and dida) were found to be resistant to high con-trations of anionic alkylbenzene sulfonates and legrade subinhibitory concentrations of these rgents. This suggests the use of these yeasts in oving alkylbenzene sulfonates from sewage or ustrial wastes. High detergent densities showed lective effect on yeasts, and may be a factor in laining the prevalence of Candida krusei in age and urban waters. (Mortland-Battelle)
1-07387

DIUM FOR DIFFERENTIAL COUNT OF E ANAEROBIC FLORA IN HUMAN FECES,
echt Rijksuniversiteit (Netherlands). robiology Lab.
. A. Van Der Wiel-Korstanje, and K. C. kker.
plied Microbiology, Vol 20, No 1, p 168-169, 1970. 3 fig, 13 ref.

scriptors: *Anaerobic bacteria, *Pollutant ntification, Cultures, Microscopy, Analytical niques, Sewage, E. coli, Salmonella, Bioindica-.
ntifiers: *Feces, Bacteroides, Bifidobacteria, osiella, Enterobacter, Proteus, Fusobacterium.

ethod for differential counting of gram-positive gram-negative anaerobes in human feces on plate is presented. Some types of bifobacteri-can be identified tentatively by colony form e or by colony form and microscopy. Rein-ed clostridial agar with 1 percent glucose was l as base medium. Horse blood (7.5 percent) China blue (0.03 percent) were added after ilization and cooling to 50C. Organisms of the bacteroides group grew with blue translucent colonies, whereas bifidobacteria grew with opaque brown colonies. Strains of other gram-negative bacteria such as Escherichi coli, and the genera Klebsiella, Enterbacter, Salmonella, Proteus, and Fusobacterium also produced blue translucent colonies. (Mortland-Battelle)
W71-07388

YEASTS ISOLATED FROM THE SOUTH SASKATCHEWAN, A POLLUTED RIVER,
National Research Council of Canada, Saskatoon, (Saskatchewan). Prairie Regional Lab.
J. F. T. Spencer, P. A. J. Gorin, and N. R. Gardner.
Canadian Journal of Microbiology, Vol 16, p 1051-1057, 1970. 3 fig, 4 tab, 18 ref.

Descriptors: *Yeasts, *Sewage effluents, Rivers, Sampling, Domestic wastes, Cultures, Isolation, Bionindicators.
Identifiers: *Proton magnetic resonance, Saskatchewan River (Canada) Canada.

Minimum numbers of yeasts isolated from the Saskatchewan River in the summers of 1964 and 1965 ranged from 400 to 500 cells/liter upstream from the city of Saskatoon, to 4600 cells/liter immediately downstream. In the summer of 1968, a period of extremely low water, the counts were 150 cells/liter upstream from the city and 30,000 cells/liter downstream. Proton magnetic resonance spectra of the mannose-containing polysaccharides from representative cultures of the different species isolated were used as an aid in classification. Most of the species were asporogenous, and included representatives of the genera Candida, Trichosporon, Rhodotorula, Torulopsis, and Crytococous. Some species of Pichia, Saccharomyces, and Debaryomyces were isloated. The yeasts were mostly introduced into the river with the effluent from the Saskatoon sewage system. (McCann-Battelle)
W71-07389

CHARACTERIZATION OF BOTTOM SEDIMENTS: CATION EXCHANGE CAPACITY AND EXCHANGEABLE CATION STATUS,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 02K.
W71-07390

INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF CHLORIDE BY SOLVENT EXTRACTION AS TRIS (1,10-PHENANTHROLINE) IRON (II) THIOCYANATE,
Hiroshima Univ., (Japan). Dept. of Chemistry.
Y. Yamamoto, T. Kumamaru, A. Tatehata, and N. Yamada.
Analytica Chimica Acta, Vol 50, No 3 p 433-438, June 1970. 2 fig, 2 tab, 7 ref.

Descriptors: *Spectrophotometry, *Chloride, *Colorimetry, *Separation techniques, Fresh water, Sulfates, Phosphate, Fluoride, Carbonate, Potassium, Sodium, Sulphide, Analytical techniques.
Identifiers: *Chemical interference, Acetate, Ammonium ions, Bromide, Iodide, Cyanide, Thiocyanate, Turbidimetry, Mercury ions.

An indirect spectrophotometric method for the determination of small amounts of chloride in fresh waters is described. Chloride ions react with mercury (II) thiocyanate to liberate thiocyanate ions, which can be selectively extracted into nitrobenzene with tris (1,10-phenanthroline) iron (II) chelate cations. The red color (516 nm) of the organic phase measured against a reagent blank is proportional to the initial concentration of chloride ions in the aqueous phase. Beer's law is obeyed over the concentration range of from 0 to the minus 5th power to 5.6 to the minus 5th power M of chloride. The color stability and the apparent sensitivity are better than those of the mercury (II) thiocyanate-iron (III) method. Large amounts of sulphate, phosphate, fluoride, carbonate, acetate, potassium, and ammonium ions had negligible or no effect; bromide, iodide, cyanide, sulphide, and thiocyanate interfered. (McCann-Battelle)
W71-07391

ATOMIC ABSORPTION AND FLUORESCENCE SPECTROSCOPY WITH A CARBON-FILAMENT ATOM RESERVOIR. PART III. A STUDY OF THE DETERMINATION OF CADMIUM BY ATOMIC FLUORESCENCE SPECTROSCOPY WITH AN UNENCLOSED ATOM RESERVOIR,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
J. F. Alder, and T. S. West.
Analytica Chimica Acta, Vol 51, No 3, p 365-372, Sept 1970. 5 fig, 3 tab, 5 ref.

Descriptors: *Spectroscopy, *Fluorescence, Argon, Nitrogen, Instrumentation, Heavy metals, Analytical techniques.
Identifiers: *Cadmium, Atomic fluoresence spectroscopy, Atomic absorption spectroscopy, Chemical interference.

A modified filament atom reservoir cell is described which permits atomic fluorescence measurements to be made without surrounding the electrically heated graphite element with a glass dome. The fluorescence behavior of cadmium in this atom reservoir is given. At 228.8 nm, cadmium exhibits resonance fluorescence more strongly in argon than in nitrogen, but at 326.1 nm cadmium exhibits much strnger 'stepwise fluorescence' in nitrogen than in argon. Nitrous oxide, carbon dioxide, and hydrogen atmospheres show very strong quenching action at 228.8 nm and no luminescence is shown at 326.1 nm. Various interference effects and their elimination are discussed. The detection limits for cadmium are 1.5 to the minus 13th power g (0.00015 p.p.m.) at 228.8 nm in argon and 3 to the minus 13th power g (0.0003 p.p.m.) in nitrogen. (McCann-Battelle)
W71-07392

THE TITRIMETRIC DETERMINATION OF MERCURY (II) WITH THIOACETAMIDE,
Eastman Kodak Co., Rochester, N. Y. Research Labs.
Barbara Coulter, and David G. Bush.
Analytica Chimica Acta, Vol 51, No 3 p 431-436, Sept 1970. 2 fig, 1 tab, 9 ref.

Descriptors: *Volumetric analysis, *Halides, Ions, Organic compounds, Heavy metals.
Identifiers: *Mercury, *Thioacetamide, Schoniger combustion, (Ethylenedinitrilo)-tetraacetic acid (EDTA), Chemical interference.

A rapid method is described for the direct titration of mercury (II) in the presence of halide ions, which cause interference in classical titrations. The mercury (II), in an alkaline solution as the (ethylenedinitrilo) tetraacetic acid (EDTA) complex, is titrated potentiometrically with thioacetamide and a silver sulfide-calomel electrode pair. Organomercury compounds which are not soluble in alkaline EDTA may be titrated after Schoniger combustion. The relative error of the method is 1 percent. (McCann-Battelle)
W71-07393

THE DETERMINATION OF LEAD BY ATOMIC FLUORESCENCE SPECTROSCOPY,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
R. F. Browner, R. M. Dagnall, and T. S. West.
Analytica Chimica Acta, Vol 50, No 3, p 375-381, June 1970. 1 fig, 3 tab, 13 ref.

Descriptors: *Spectroscopy, *Fluorescence, Aluminum, Argon, Heavy metals, Flame photometry, Analytical techniques.
Identifiers: *Lead, Atomic fluorescence spectroscopy, Signal-noise ratios, Optical system,

Chemical interference, Atomic absorption spectroscopy.

The atomic fluorescence characteristics of lead are described in air-acetylene, nitrous oxide-hydrogen, and argon-oxygen-hydrogen flames. An electrodeless discharge tube is used as the source of excitation. A detection limit of 0.01 microgram/ml of lead in aqueous solution is obtained by measurement of the direct-line fluorescence at 405.8 nm in the argon-oxygen-hydrogen flame. The effect of 100-fold excesses of 30 cations and anions is examined: only aluminum interfered significantly. Effects of multipass optics and signal collection mirrors are examined and their effect on signal-noise ratios is discussed. The study confirmed that lead can be determined more sensitively by atomic fluorescence than by atomic absorption or flame photometry. (McCann-Battelle)
W71-07394

SINGLE COLUMN GAS LIQUID CHROMATOGRAPHY OF METHYL PARATHION AND METABOLITES USING TEMPERATURE PROGRAMMING,
California Univ., Riverside. Dept. of Entomology.
P. S. Jaglan, and F. A. Gunther.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 2, p 111-114, Mar/Apr 1970. 2 fig, 6 ref.

Descriptors: *Gas chromatography, *Pesticide residues, *Separation techniques, *Organophosphorus compounds, Water analysis.
Identifiers: *Metabolites, *Methyl parathion, programmed temperature gas chromatography.

Programmed temperature gas chromatography (ptgc) can rapidly separate mixtures of compounds with extremely wide boiling ranges and produce sharp symmetrical peaks that are amenable to qualitative and quantitative interpretation. Using an isothermal operation, dialkyl acid metabolite of methyl parathion could be separated and resolved only with special procedures. However, when six of these compounds were analyzed with ptgc, only methyl paraoxon and desmethylemethyl paraoxon were not resolved. These compounds are not separated because the latter is converted into the former due to column esterification. In evaluating the practicability of the method, it was found that relatively few samples per day could be analyzed with meaningful results because of the time needed for temperature equilibration and the need for duplicate injections to validate results. Other studies have shown that column life may be shortened, and some compounds, such as azinphosmethyl and coumaphos, are decomposed or altered. Quantitative variations as large as 10-20 percent were observed, which could be an important limitation. Nonetheless, the value of ptcg in the qualitative separation of compounds of wide volatilities is evident. (Mortland-Battelle)
W71-07395

COMPARISON OF SEVERAL LIQUID PHASES IN GAS LIQUID CHROMATOGRAPHY OF METHYL PARATHION AND METABOLITES,
California Univ., Riverside. Dept. of Entomology.
P. S. Jaglan, and F. A. Gunther.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 2, p 98-103, Mar/Apr 1970. 1 tab, 6 ref.

Descriptors: *Gas chromatography, *Separation techniques, *Organophosphorus compounds, Metabolism, Laboratory equipment.
Identifiers: *Metabolites, *Methyl parathion.

A program is reported to determine organophosphorus compounds by gas liquid chromatography (glc). In this phase of the effort, a comparison is made of the different liquid phases (from 1 to 20 percent coatings) in their ability to separate methyl parathion from its metabolites. Under isothermal conditions, the separation of methyl paraoxon, desmethyl methyl parathion, desmethyl methyl paraoxon, dimethyl phosphorothioic acid, and dimethyl phosphoric acid was not ideal on a single column because the dialkyl compounds eluted very rapidly, while other compounds eluted slowly as rounded or flattened peaks. A glc system is required in which the quantitative separation of low percentage components can be reproducibly accomplished. This can be achieved at low temperatures, but late eluting peaks become broad and unamenable to quantitation. The polar phases were found to be primarily useful for qualitative purposes and the Apiezon L column was found most promising for quantitative purposes. (Mortland-Battelle)
W71-07396

SOURCES OF COMPOUNDS INTERFERING WITH THE ANALYSIS OF EXTRACTS FOR DIELDRIN AND DDT BY GLC,
Massachusetts Univ., East Wareham. Cranberry Experiment Station.
Karl H. Deubert.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 4, p 379-382, July/Aug 1970. 1 tab, 9 ref.

Descriptors: *Water pollution sources, *Insecticides, *Rubber, *Oil, *Runoff, Gas chromatography, Chemical waste, DDT, Dieldrin, Water analysis, Soil analysis, Lubricants, Gasoline, Analytical techniques.
Identifiers: *Polychlorinated biphenyls, Tar, Chemical interference.

Analysis of soil and water by gas liquid chromatography (GLC) is complicated by unidentified peaks in chromatograms. It has been found that polychlorinated biphenyls (PCB's) may be responsible for such peaks in chromatograms of extracts of birds and fishes, and the same may be true for soil and waters. In this study, possible sources of such compounds other than fallout from the chemical industry were considered. Gas chromatography was used to analyze a variety of samples: tire rubber, road tar, synthetic fabric, rubber base board, several lubricants, kerosene, and gasoline. The analyses indicated that there are a variety of sources of compounds that may interfere with quantitation of common chlorinated hydrocarbon insecticides by GLC. Suggested environmental sources of these compounds are: rubber tires or engine oil, road surfaces, and runoff water. (Mortland-Battelle)
W71-07397

EFFECTS OF VARIOUS METALS ON BEHAVIOR OF CONDITIONED GOLDFISH,
California Univ., San Francisco.
Patricia A. Weir, and Charles H. Hine.
Archives Environmental Health, Vol 20, p 45-51, Jan 1970. 4 fig, 4 tab, 14 ref.

Descriptors: *Water pollution effects, *Toxicity, *Fish behavior, *Bioindicators, Sodium arsenate, Psychology, Wastes, Heavy metals, Standards, Water quality.
Identifiers: *Mercury ions, *Selenium ions, *Lead ions, *Sodium ions, *Goldfish, Mercury chloride, Lead nitrate, Selenium dioxide.

The deleterious effects on goldfish of four metal ions at several sublethal concentrations were measured by a conditional avoidance technique. The metals evaluated were chosen since their effect on the central nervous system is known and they are found in aquatic environments as natural and industrial contaminants. The compounds used were: sodium arsenate, lead nitrate, mercuric chloride, and selenium dioxide. The metals were tested in decreasing doses, beginning at 50 percent of their lethal concentrations, until no effects were observed. All of the metals tested impaired performance at concentrations below their lethal level. Mercury was the most potent, producing measurable effects at 0.003 p.p.m. As a result of this study, behavioral toxicity techniques are suggested as useful in setting water quality standards. (Mortland-Battelle)
W71-07398

INFRARED DETERMINATION OF INORGANIC NITRATES BY THE PELLET TECHNIQUE; INFRARED DETERMINATION OF TWO INORGANIC NITRATES IN THE PRESENCE OF EACH OTHER,
Frankford Arsenal, Philadelphia, Pa.
David E. Chasan, and George Norwitz.
Applied Spectroscopy, Vol 24, No 2, p 283-287, 1970. 2 fig, 4 tab, 4 ref.

Descriptors: *Analytical techniques, *Spectrophotometry, *Nitrates, *Inorganic compounds, Potassium compounds, Sodium compounds, Pollutant identification.
Identifiers: *Infrared spectrophotometry, Pellet techniques, Sodium nitrate, Potassium nitrate, Barium nitrate, Strontium nitrate.

The quantitative spectrophotometric determination of inorganic nitrates (sodium, potassium, barium, and strontium) by the pellet technique was investigated. In these methods, the nitrate was weighed into a small tared mortar, 300 mg of potassium bromide was added, the pellet was formed and absorbances were determined at the appropriate peak. The peaks recommended for sodium, potassium, barium, and strontium nitrates are 836, 825, 730, and 737 (1/cm), respectively. Methods are also proposed for the determination of two nitrates in the presence of each other. For the analysis of a mixture of sodium nitrate and potassium nitrate, measurements were made for sodium nitrate at 836 (1/cm) and for potassium nitrate at 825 (1/cm). For the analysis of a mixture of barium nitrate and strontium nitrate, measurements were made for barium nitrate at 730 (1/cm) and for strontium nitrate at 737 (1/cm). The methods for the determination of two nitrates can be used down to a ratio of 1 to 20. For lesser ratios the errors were rather large. Sulfate did not interfere with any of the procedures. These methods could probably be applied to other combinations of nitrates. (Mortland-Battelle)
W71-07399

A KINETIC METHOD FOR THE DETERMINATION OF FLUORIDE IN THE PARTS-PER-BILLION RANGE,
Freiburg Univ., Freiburg Br., German Federal Republic, Chemical Laboratory.
Dieter Klockow, Heiner Ludwig, and Miguel A. Giraudo.
Analytical Chemistry, Vol 42, No 14, p 1682-1686, Dec 1970. 2 fig, 1 tab.

Descriptors: *Analytical techniques, *Fluoride, *Volumetric analysis, Catalysts, Aqueous solutions, Electrodes.
Identifiers: *Kinetic method, Chemical interference.

Small quantities of fluoride in aqueous solutions can be determined by an indirect kinetic method in which zirconium, acting as a catalyst in the reaction between perborate and iodide, is inhibited by fluoride. In this method, different reaction rates corresponding to the amounts of fluoride present are monitored as follows: perborate is present in excess and iodide is added to the mixture by an automatic titrator to the same extent as the reaction proceeds. The rate of addition of the iodide standard solution is a measure for the reaction rate and consequently, for the concentration of the catalyst (zirconium) or the inhibiting agent (fluoride), respectively. The addition of iodide is controlled by measuring the potential of the iodide/iodine couple. The method has a working range of 19 ng to 190 ng F- per 50 ml or 0.38 to 3.8 p.p.b. The influence of 20 cations and anions on the determination was examined. Several of these caused serious interference, which suggests that they could be determined by the prescribed method. (Mortland-Battelle)
W71-07400

HARACTERIZATION OF CRUDE AND ESIDUAL-TYPE OILS BY FLUORESENCE PECTROSCOPY,
deral Water Pollution Control Administration, thens, Ga. Southeast Water Lab.
D. Thruston, and R. W. Knight.
nvironmental Science and Technology, Vol 5, No p 64-69, Jan 1971. 3 fig, 4 tab, 6 ref.

escriptors: *Spectroscopy, *Oil wastes, Oil, luoresence, Weathering, Sampling, Analytical chniques.
entifiers: *Fluoresence spectroscopy, *Oil spill, olatiles, Crude oil, Sunlight, Residual oil.

is method for measuring fluorescence emission ensities of an oil is a rapid and precise method r the comparative identification of crude and mi-refined oils. With samples from an actual oil ill, it was demonstrated that the results of this orescence method were in agreement with those four other oil identification methods. Low-boil- volatiles found in crude oils showed no orescing properties in crudes tested, and no alytical problems resulted when volatiles were noved by evaporation before analysis. It should emphasized that immediate sampling of an oil ill is very important because prolonged exposure sunlight can affect fluorescence properties of the . Also, enough samples should be taken to tablish variabilities of parameters within an oil ck. For a comparative identification, it is virlly impossible to tell if oil 'A' is the same as or ferent from oil 'B' unless a sufficient number of plicate samples of both is obtained. This method ght be applicable to other types of oils with use other fluorescence excitation and emission max- a. (McCann-Battelle)
71-07402

PPLICATIONS OF ION-EXCHANGE RESINS NON-AQUEOUS MEDIA TO THE SEPARA- ON AND ANALYSIS OF PETROLEUM ADDI- VES,
itish Petroleum Co., Ltd., Sunbury-on-Thames ngland). Research Centre.
V. Webster, J. N. Wilson, and M. C. Franks.
urnal of the Institute of Petroleum, Vol 56, No 7, p 50-56, Jan 1970. 5 fig, 6 tab, 9 ref.

escriptors: *Ion exchange, *Separation chniques, *Oil wastes, Pollution identification, sins, Trace elements, Dieldrin, Analytical chniques.
entifiers: *Oil additive, *Alkylphenols, Biological sidues, Pentachlorophenol, Chemical interence.

on-aqueous ion-exchange procedures were used the separation and analysis of hindered alphenols and aromatic amines. The novel use of ion-exchange resins with transition metal unter-ions for the separation and analysis of adives which form metal complexes is also scribed. This method possesses the merits of simcity and versatility, and can avoid the use of stly apparatus. Compared with the classic ethods of liquid extraction, the procedures are an and avoid the difficulties of entrainment and ulsion formation. There is virtually no limit to e size of sample which may be processed in order recover sufficient material for subsequent analy- . The technique has also been used in the fundaental analysis of petroleum, the separation of ce contaminants, and the analysis of biological sidues. It has been incorporated into routine con- l testing, e.g. in the pesticide field for the deternation of dieldrin in the presence of penchlorophenol. (McCann-Battelle)
71-07403

ONTINUOUS MONITORING OF AROMATIC OMPOUNDS IN WATER BY DIFFERENTIAL IOTOMETRY,
i Pont de Nemours (E. I.) and Co., Wilmington, el.
obert S. Saltzman.
Analysis Instrumentation, Vol 6, p 79-85, 1969. 6 fig, 4 ref.

Descriptors: *Industrial wastes, *Phenols, *Photometry, Monitoring, Instrumentation, Hydrogen ion concentration, Automation.
Identifiers: *Ultraviolet absorption, Benzene, Toluene, Xylene, Pyridine.

Monitoring of plant effluents for the presence of aromatic compounds is complicated by the presence of these compounds in the incoming water. However, by continuously monitoring the UV absorption of the influent and effluent, the difference in absorption at the two points provides a measure of the plant contribution to water pollution. The systems in use at E. I. Du Pont in Wilmington, Delaware employ either dual-beam or split-beam analyzers. Where high sensitivity is required, the system incorporates an automatic zero adjustment. For monitoring monocyclic aromatic hydrocarbons, the 254 nm line from a mercury lamp is used as the UV source. However, where polycyclic aromatic, phenol, or pyridine are present, erroneously high analyses may result. But even with this limitation, the concentration of components in the effluent may be constant so that the monitor can be calibrated to measure total concentration. Specific monitoring of low concentrations of phenols can be accomplished by measuring the characteristic wavelength shift of phenol with pH. This method consists of measuring the difference in UV absorption of a sample made highly basic and then made slightly acid. Since only phenol shows this basochromatic shift, the method is highly selective. Schematics of the monitoring systems are shown. (Little-Battelle)
W71-07404

APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO HYDROCARBON-TYPE ANALYSIS,
Shell Oil Co., Deer Park, Tex. Houston Research Lab.
P. V. Peurifoy, M. J. O'Neal, and L. A. Woods.
Journal of Chromatography, Vol 51, No 2, p 227-235, Sept 16, 1970. 7 fig, 4 tab, 7 ref.

Descriptors: *Chromatography, *Oil, *Separation techniques, Resins, Analytical techniques.
Identifiers: Thin layer chromatography, Heavy oil.

Thin-layer chromatography has been applied to the hydrocarbon-type separation of heavy oils, with emphasis on separation of petroleum resins. A three-stage discontinuous layer-gradient plate was employed and found to give better separation of hydrocarbon types than a single absorbent plant. Various solvent combinations were utilized and placed in an eluotropic series as applied to petroleum resin separation. Semiquantitative information was obtained from a completed chromatogram plate by measuring the size of the bands or spots with a ruler or photoelectric scanner. (Little-Battelle)
W71-07405

A NEW RAPID METHOD FOR THE PRODUCTION OF PERMANENT STAINED SLIDES OF MARINE PLANKTON,
Connecticut Coll., New London. Marine Science Program.
Peter A. Lindquist, and Robert De Santo.
Journal of Microscopy, Vol 92, Part 2, p 153-154, Oct 1970. 1 fig, 2 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Analytical techniques, Marking techniques, Membranes, Filters.
Identifiers: Sample preservation.

Preparation time for stained slides of marine plankton has been reduced by filtering plankton samples through a Millipore Hydrosol Stainless filter head adapted to accept a 13 mm, 1.2 micron white filter which is then partially dried and transferred to a blotter floated on a bath of xyene. After the filter becomes transparent, as a result of the xylene, it is transferred to a slide where Turtox stain-mountant is applied. The mountant stains zooplankton whereas the phytoplankton generally remain unstained but identifiable. Total preparation time for the slides is about 15 minutes. (Little-Battelle)
W71-07408

CURRENT WATER QUALITY CONTROL PRACTICES,
H. E. Robbins.
Quality Progress, Vol 111, No 10, p 18-23, Oct 1970. 3 tab, 17 ref.

Descriptors: *Water quality control, *Analytical techniques, *Waste treatment, E. coli, Chemical oxygen demand, Biochemical oxygen demand, Bioindicators, Industrial wastes, Costs, Water reuse.
Identifiers: Specific ion electrodes.

This paper reviews the general effects of water pollution, the sources and types of pollutants, the analytical methods employed and their deficiencies, costs of waste treatment, the industrial usage of water, and the need for further studies to develop improved analytical methods and to determine the ecological effects of wastes. (Little-Battelle)
W71-07409

AUTOMATED COUNTING OF MICROBIAL COLONIES,
Minnesota Univ., Minneapolis. Dept. of Chemical Engineering; and Minnesota Univ., Minneapolis. Dept. of Microbiology.
D. J. Schoon, J. F. Drake, A. G. Fredrickson, and H. M. Tsuchiya.
Applied Microbiology, Vol 20, No 5, p 815-820, Nov 1970. 8 fig, 4 tab, 4 ref.

Descriptors: *E. coli, *Automation, *Instrumentation, Lactobacillus, Azotobacter, Electronic equipment, Cultures.
Identifiers: *Counting, *Capillary tube scanner, Coulter counter, Bacillus subtilis, Basillus licheniformis.

The time required for direct counting of colonies on agar plates for estimating population density of viable microorganisms has precluded studies requiring measurement of such a parameter. Bowman, Blume, and Vurek have described a photoelectrical capillary tube scanner which automates the counting. Results obtained with an instrument similar to that of Bowman et al. have been intensively analyzed with respect to precision and accuracy. The sources of 'errors' have been ascertained, and the instrument's potentialities and limitations are discussed. Counts of almost 200,000 capiliary tube readings were made during the course of this study. (McCann-Battelle)
W71-07411

A POLYCHLORINATED BIPHENYL (AROCLOR 1254) IN THE WATER, SEDIMENT, AND BIOTA OF ESCAMBIA BAY, FLORIDA,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W71-07412

FURTHER STUDIES ON THE DIFFERENTIATION OF CLOSTRIDIUM SORDELLII FROM CLOSTRIDIUM BIFERMENTANS BY GAS CHROMATOGRAPHY,
National Communicable Disease Center, Atlanta, Ga.
John B. Brooks, V. R. Dowell, D. C. Farshy, and A. Y. Armfield.
Canadian Journal of Microbiology, Vol 16, p 1071-1078, 1970. 3 fig, 3 tab, 13 ref.

Descriptors: *Clostridium, *Cultures, *Gas chromatography, *Pollutant identification, Carbohydrates, Biochemistry.

Identifiers: Clostridium bifermentans, Clostridium sordellii, Gas-liquid chromatography, Urease, Amines, Chloroform.

Amines produced by 31 strains of the Clostridium bifermentans and C. sordelli groups were compared by examining trifluoroaceticanhydride derivatives of basic-chloroform extracts from spent cultural medium by gas-liquid chromatography (g.l.c.) All of the urease-positive strains (16) exhibited an amine profile consistent with that of C. sordellii. On the other hand, 12 of 15 urease-negative strains produced amine g.l.c. patterns like that of C. bifermentans, and three strains produced amine patterns identical with that of C. sordellii. The carbohydrate composition of some of the strains was determined by g.l.c. of trimethylsilyl derivatives of acid-digested formamide extracts of whole cells. Two of the three urease-negative strains with amine profiles like C. sordellii had a carbohydrate composition similar to that of C. sordelli, and the other strain had a carbohydrate profile more like that of C. bifermentans. One known strain of C. bifermentans had a carbohydrate profile with characteristics of both C. bifermentans and C. sordellii. The results of this study point out the variability of urease production by C. sordellii and the value of gas chromatography in differentiating this organism from C. bifermentans. (Mortland-Battelle)
W71-07414

HETEROTROPHIC NUTRITION OF THE MARINE PENNATE DIATOM, CYLINDROTHECA FUSIFORMIS,
Washington Univ., Seattle. Dept. of Oceanography.
Joyce Lewin, and Johan A. Hellebust.
Canadian Journal of Microbiology, Vol 16, p 1123-1129, 1970. 2 fig, 4 tab, 8 ref.

Descriptors: *Diatoms, *Nutrient requirements, *Organic compounds, Littoral, Yeasts, Radioactivity techniques, Pigments, Trophic level, New Jersey, North Carolina, Georgia, Louisiana, Texas, Aquatic microbiology, Cultures.
Identifiers: *Cylindrotheca fusiformis, *Heterotrophic nutrition, Chromatosphore structure.

The capability of Cylindrotheca fusiformis, a marine littoral pennate diatom, for growth by heterotrophic nutrition in darkness was investigated. Lactate, fumarate, melate, Tryptone, Casamino acids, and yeast extract served as organic substrates. Glucose was not successfully used as a substrate. The generation time under optimum conditions in the dark was around 30 hours, compared to 12.5 hours at 2000 lux for cells growing autotrophically in the light. The pigment composition of dark grown cells was similar to that of light-grown cultures, except that diadinoxanthin was not detected in the dark-grown cells. Chromatophore structure in dark-grown cells was normal. Cells brought into the light after three weeks in the dark evolved oxygen immediately upon illumination. Cells did not multiphy under anacrobic conditions in the dark but could survive under these conditions for at least two months. Experiments with radioactively labeled organic compounds confirmed the growth experiments. It is not known if Cylindrotheca fusiformis in its natural habitat has the opportunity to make use of the capability for helerotrophic growth. However, five other strains isolated from widely scattered locations demonstrated the same ability. (Mortland-Battelle)
W71-07415

CHARACTERIZATION OF CLOSTRIDIA BY GAS CHROMATOGRAPHY: DIFFERENTIATION OF SPECIES BY TRIMETHYLSILYL DERIVATIVES OF WHOLE-CELL HYDROLYSATES,
National Communicable Disease Center, Atlanta, Ga. Bacteriology Section.
David C. Farshy, and C. W. Moss.
Applied Microbiology, Vol 20, No 1, p 78-84, July 1970. 1 fig, 6 tab, 21 ref.

Descriptors: *Clostridium, *Gas chromatography, *Cultures, *Pollutant identification, Hydrolysis, Biochemistry, Systematics.
Identifiers: Gas-liquid chromatography, Trimethylsilyl.

Trimethylsilyl (TMS) derivatives prepared from whole-cell hydrolysates of 36 strains, representing 10 species of Clostridium were examined by gas-liquid chromatography (GLC). The TMS profile of each species contained a group of peaks which chacterized the species. Variation among strains within a species was much lower than variation between species. Some of the closely related clostridia could be differentiated by comparing their TMS profiles. Strains of Clostridium botulinum were distinguished from C. sporogenes on the basis of the ratio of two GLC peaks which corresponded to arabinose and glucose. A peak with a retention time identical to that of mannose was present in all C. bifermentans strains but was absent in those of C. sordellii. GLC is a useful technique for characterizing microorganisms. It is best used to compare only a few species at a time and is particularly valuable where differentiation of species by conventional biochemical tests is difficult. (Mortland-Battelle)
W71-07416

RETENTION OF MERCURY BY SALMON,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
Donald F. Amend.
Progressive Fish-Culturist, Vol 32, No 4, p 192-194, Oct 1970. 1 tab, 4 ref.

Descriptors: *Retention, *Salmon, Sampling, *Pollutant identification, Standards, Fish, *Sockeye salmon.
Identifiers: *Mercury, Muscle tissue, Kidney.

Juvenile sockeye salmon treated repeatedly with mercurials accumulated and retained high levels of mercury in their tissues for several months, but after four years at sea they contained normal levels of mercury in all tissues examined. Adult chinook and coho salmon also treated with mercurials as juveniles did not show abnormal levels of mercury. However, adult salmon exposed to mercury upon returning from the sea, or mercurial-treated juvenile fish, may contain abnormal levels of mercury. The dithizone photometric method (Association of Official Agricultural Chemists, 1965) was used to determine mercury content in fish. (Upadhyaya-Vanderbilt)
W71-07433

TRACE METAL CHARACTERIZATION IN AQUATIC ENVIRONMENTS BY ANODIC STRIPPING VOLTAMMETRY,
Bureau of Commercial Fisheries, Ann Arbor, Mich.
H. E. Allen, W. R. Matson, and K. H. Mancy.
Journal Water Pollution Control Federation, Vol 42, No 4, p 573-581, Apr 1970. 5 fig, 2 tab, 13 ref.

Descriptors: *Heavy metals, *Trace elements, Aquatic environment, *Electrolysis, Chemical analysis, Water pollution sources, *Pollutant identification.
Identifiers: Anoding stripping voltammetry, Electrodesposition.

Anodic stripping voltammetry may be used for quantitative determination of traces of metals in natural water. Less than 0.1 mg/l Pb..2 can be measured in natural waters without preconcentration of the sample. Metals from the sample are electrodeposited on composite mercury-graphite electrodes. Quantitative determination of the deposited metals is made by anodic stripping using a chronoamperometric technique. With short desposition times the kinetics of complexation of metals with naturally occurring complexing agents may be studied. The rates of exchange of complexed metals after the addition of acid or other metal cations also may be determined. (Oleszkiewicz-Vanderbilt)
W71-07445

MORE ON MERCURY,
Michigan Univ., Ann Arbor. Phoenix Memori
Lab.
John D. Jones.
Journal American Water Works Association, V
62, No 8, p 526, Aug 1971.

Descriptors: *Analytical techniques, *Neutron a
tivation analysis, *Potable water, Water quali
Heavy metals, *Pollutant identification.
Identifiers: *Mercury.

The author indicates the fact that the previo
statement of the Bureau of Water Hygiene, US PH
on the problem of mercury in water supplies (Jou
nal American Water Works Association, Vol 6
No 5, p 285, 1970) completely ignores one of th
most sensitive and precise methods of analys
known-the neutron activation analysis. The omi
sion is particularly surprising in view of the fact th
much of the analytical work being performed
Canada, where the problem of mercury contamin
tion was first identified, has been done by th
method. The author quotes Bernt Sjostrand th
the sensitivity limit for biological material is le
than 0.5 parts per billion, which is well below th
possible with other available methods. In additio
chemical processing is usually greatly simplifie
eliminating the possibility of erroneous results d
to losses. (Oleszkiewicz-Vanderbilt)
W71-07446

MERCURY IN WATER SUPPLIES.

Journal American Water Works Association, V
62, No 5, p 285, May 1970. 3 ref.

Descriptors: *Water quality, *Potable wate
*Analytical techniques, Pollutant identificatio
*Standards.
Identifiers: *Mercury, Dithizone method, Publ
Health Service Drinking Water Standards Comm
tee.

The Bureau of Water Hygiene of the United Stat
Public Health Service has tentatively proposed
standard of 0.005 ppm for mercury in the drinki
water. The rationale for such a low rejection lim
stems from the danger to human health from eith
the acute or chronic ingestion of inorganic and o
ganic mercurials. The limit of 0.005 ppm is co
sidered to contain a reasonable 'safety factor' f
the protection of human health in consideration
degree of exposure, routes of entry, metabolic ra
and exertion rate of the heavy metal. The newl
formed Public Health Service Drinking Wat
Standards Committee is expected to review the te
tative standard for mercury as well as any ne
scientific information which may influence t
quantity of mercury allowed in potable water, a
to make specific recommendation for the mercu
standard. A brief review of analytical methods
given with an indication that the best availab
method for the determination of mercury is t
dithizone method. Practical sensitivity of th
technique is reported to be within the limits
0.001 to 0.01 ppm. (Oleszkiewicz-Vanderbilt)
W71-07448

**AN AUTOMATED METHOD FOR MEASUR
ING NANOGRAM QUANTITIES OF O
GANOPHOSPHORUS POISONS,**
Army Environmental Hygiene Agency, Edgewo
Arsenal, Md.
Thomas L. Hess.
Available from the National Technical Informati
Service as AD-717 558, $3.00 in paper copy, $0.
in microfiche. Nov 13, 1970. 13 p, 5 fig, 1 tab
ref.

Descriptors: *Organophosphorus compoun
Colorimetry, Analytical techniques.
Identifiers: *Colorimetric analysis, *Chemical w
fare agents, *Toxic agent alarms, *Enzymes, To
agent alarms, Microanalysis, Cholinestera

cetylcholinesterase, Nerve agents, V agents, Automatic.

fast and accurate, automated method was veloped for measuring nonogram quantities of ganophosphorus compounds. The method emys the use of bovine erythrocyte cholinesterase. e cholinesterase that is not inhibited is reacted th the substrate, acetylthiocholine iodide. The ocholine released from the enzyme-substrate action is reacted with 5,5'-dithio-bis-2-robenzoic acid to produce the color that is alyzed at a wavelength of 420 millimicron on a chnicon AutoAnalyzer.
71-07456

TERMINATION OF FLUORIDE POLLUNTS IN NATURAL WATERS USING A NOWN-ADDITION TECHNIQUE,
val Research Lab., Washington, D.C.
eodore B. Warner.
ailable from the National Technical Information rvice as AD-717 595, $3.00 in paper copy, $0.95 microfiche. NRL Report 7216, Dec 14, 1970. 16 4 tab, 24 ref.

scriptors: *Fluorides, Halides.
ntifiers: *Water pollution, *Potentiometers, is, Aluminum, Iron, Calcium, Magnesium, Ers, Estuaries, Sea water, Reavers.

loride concentrations in complex natural waters, ch as estuaries, rivers, or lakes, may be measured ng an ion-selective electrode and a known-addin technique in conjunction with a complexing ffer. No additional information, such as interfer- ion concentrations or ionic strength, is needed. liable measurements may be made in river ters containing as much as 25 mg/l Al3.., 125 /l Fe3.., 20 g/l Ca2.., or 2.5 g/l Mg2... Results are curate to about 0.02 mg F/l. In rivers, the relative ndard deviation is 1% to 2% when the fluoride ncentration is 1 mg/l and up to 5% when its conntration is 0.1 mg/l. In estuaries, the relative ndard deviation ranges between 0.3% and 1.0% der typical conditions.
71-07457

EVELOPMENT AND PERFORMANCE OF A OBILE WATER QUALITY MONITOR,
ymond W. Raible, and M. K. Testerman.
van Instr, Vol 24, Part 3, 1969. 3 fig, 6 ref, 5 p.
esented at the Instrument Society of America th Annual Conference, Oct 27-30, 1969.

scriptors: *Instrumentation, Control systems, lonitoring, *Pollutant identification, *Data coltions.

mobile water quality monitor intended for exded unattended use in locations where power es are not available and for survey use is scribed. All solid state electronics are employed. ld tests have been performed for the past 2 1/2 ars. Conclusions and problems concerning the nitors and transducers will be reviewed. Sugtions for future development are given.
71-07536

IME NEED: INSTRUMENTS FOR USE IN ELD,
ne J. Bender.
wer, Vol 114, No 10, p 50-53, Oct 1970.

scriptors: Water pollution control, *Instrumenion, *Monitoring, Administration, Methodology, ollutant identification, Measurement.

demand for pollution control has increased, so the need for adequate instrumentation. Control water pollution has reached a standard clearly ead of air pollution control, and resolves itself o a matter of cost. Water management is becom increasingly popular; monitoring instruments lude pH meters, turbidity indicators, dissolvedids recorders, DO, BOD, and COD meters, oxidation-reduction-potential sensors, and chloride-ion analyzers. The article contains recent developments in the following areas of methodology and instrumentation: the carbonaceous analyzer, atomic absorption, sewage treatment monitors, telemetry, and flow meters.
W71-07540

MANURE PRODUCTION BY BROILERS,
Maine Univ., Orono. Dept. of Animal Science.
R. W. Gerry.
Poultry Science, Vol 47, p 339-340, 1968. 2 tab, 4 ref.

Descriptors: *Farm wastes, *Poultry, Feeds, Moisture content, Calcium, Phosphorus, Proteins.
Identifiers: *Manure production, Poultry litter, Broilers, Dry droppings, Wood shavings, Crude protein.

A test was conducted in which White Mountain x White Rock cross broiler were reared to 53 days of age and fed a modified New England College Conference starting ration. Actual production of dry matter which did not include the bedding or the moisture in the litter was 867 kilograms per 1000 males, 658 kilograms per 1000 females, and 748 kilograms per 1000 mixed sexes. The average amount of manure (litter) removed at the end of the test period was 1602 kilograms per 1000 birds. This litter included an average of about 500 kilograms of wood shavings per 1000 birds and analyzed 23 percent moisture. During the test period there was a marked increase in crude protein, calcium and phosphorus content of the litter. (White-Iowa State)
W71-07541

BIOCHEMICAL MODEL FOR THE BIOLOGICAL METHYLATION OF MERCURY SUGGESTED FROM METHYLATION STUDIES IN VIVO WITH NEUROSPORA CRASSA,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 05B.
W71-07601

PROBLEMS IN THE DETERMINATION OF SODIUM NITRILOTRIACETATE IN SEWAGE AND EFFLUENT LIQUORS,
Unilever Ltd. (England). Port Sunlight Lab.
G. F. Longman.
Proceedings of the Society for Analytical Chemistry, Vol 8, No 3, p 46, Mar 1971. 1 p.

Descriptors: *Detergents, *Water pollution sources, *Waste water (Pollution), *Sewage, *Nitrogen compounds, Analytical techniques, Heavy metals, Ion exchange, Sodium hydrogen, Pollutant identification.
Identifiers: *Sodium nitrilotriacetate, * (NTA).

The biodegradability of sodium nitrilotriacetate (NTA) in sewage and effluent liquors is studied. Four techniques for determination of NTA were examined. These were coupled with one or more steps aimed at removal of interferences. They were (a) complexometric titration with copper at pH 2.5; (b) formation of copper - NTA complex and determination of this copper with oxine; (c) potentiometric titration with copper by using a copper-ion sensitive electrode; and (d) reaction with the zinc - zincon complex. All four procedures failed to give satisfactory results and the pre-treatments when applied to our systems failed to deal adequately with removal of metals from their NTA chelates. (Woodard-USGS)
W71-07607

A COMPREHENSIVE SAMPLING SYSTEMS FOR STUDYING THE RELATION BETWEEN VISIBILITY, METEOROLOGICAL PARAMETERS AND ATMOSPHERIC POLLUTION,
Atomic Energy Research Establishment, Harwell (England).
A. E. J. Eggleton.
Proceedings of the Society for Analytical Chemistry, Vol 8, No 3, p 44-45, Mar 1971. 2 p.

Descriptors: *Air pollution, *Fog, *Smoke, *Path of pollutants, *Analytical techniques, Sampling, Atmosphere, Environmental sanitation, Ammonium compounds, Instrumentation, Meteorology, Hydrology.
Identifiers: *Environmental pollution, Ammonium sulfate, Visibility.

The northeast coast of England is subject to sea fog, especially in spring and early summer. The situation on Teesside complicated by the presence of pollutants emitted by heavy and chemical industry in the area. A new sensor for visibility measurement (nephelometer) was developed, which measures the amount of light scattered by the atmospheric aerosol when it is illuminated by light from a flash tube. Measurement of temperature, wet-bulb depression, wind speed, wind direction, rainfall and solar radiation were also made by using standard meteorological sensors. When the observations are classified by relative humidity, there is very strong correlation between the reciprocal of the visibility and the ammonium ion concentration, the slope of the regression line being dependent on the relative humidity. Calculation of the theoretical effect of an ammonium sulphate aerosol, based upon the measured particle size distribution, shows about 80 percent of the observed extinction coefficient in the atmosphere can be accounted for. Ammonium sulfate was found widely in the atmosphere. (Woodard-USGS)
W71-07608

SIMULTANEOUS DETERMINATION OF ARSENATE AND PHOSPHATE IN NATURAL WATERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
David L. Johnson.
Environmental Science and Technology, Vol 5, No 5, p 411-414, May 1971. 4 p, 3 fig, 3 tab, 16 ref.
ONR Contract N00014-68-A-0215-0003.

Descriptors: *Chemical analysis, *Water analysis, *Spectrophotometry, *Phosphates, *Arsenic compounds, Analytical techniques, Colorimetry, Instrumentation.
Identifiers: *Arsenates.

Arsenate can be measured in natural waters by a slight modification of normal phosphate methods. Since arsenate, like phosphate, forms a blue complex with molybdate while arsenite does not, the reduction of arsenate to arsenite eliminates its absorbance contribution in phosphate measurements. Thus, under appropriate conditions, the difference in absorbance between a reduced and an unreduced sample can be taken as a measure of the arsenate present. The method requires only one additional reagent. When absorbances are less than 0.3 and analyses are performed at least in triplicate, the method is sensitive to about 0.01 micromole of arsenate per liter; but when the absorbance of the sample is greater than 0.3, the inability to read the spectrophotometer precisely limits the sensitivity to 0.02 to 0.03 micromole per liter. Thus, the method may be used to measure the arsenate concentration in open-ocean water, but with poor precision. It is very convenient for water which has more arsenate than seawater, and in which the ratio of arsenate to phosphate is not too low. (Knapp-USGS)
W71-07617

POTENTIAL APPLICATION OF AN INFRARED SPECTRORADIOMETER FOR REMOTE DETECTION AND IDENTIFICATION OF OIL SLICKS ON WATER,
Gulf General Atomic Co., San Diego, Calif.
James S. Mattson, Harry B. Mark, Jr., Arnold Prostak, and Clarence E. Schutt.
Environmental Science and Technology, Vol 5, No 5, p 415-420, May 1971. 6 p, 10 fig, 1 tab, 3 ref.
FWQA Grant No 16020 ELH.

Descriptors: *Remote sensing, *Pollutant identification, *Oily water, *Spectroscopy, Water pollution control, Monitoring.
Identifiers: *Oil spill detection, *Oil spills, Spectroradiometers.

The possibility of a monitoring spectroradiometer for detection and identification of floating oil slicks is demonstrated by simulation experiments on floating organic films. The spectroradiometer has a circular variable interference filter as a monochromator and a small computer for instrument control and preliminary data reduction. For these experiments, a modulated source was used, and the floating organic films used were styrene and oleic acid, compounds which exhibit distinctive spectra in the 8.5 to 12.5 micron range. Characteristic dispersion spectra of these films were obtained successfully, and an actual oil monitoring system can probably be developed. (Knapp-USGS)
W71-07618

NOTE ON REMOVAL OF SULFUR INTERFERENCES FROM SEDIMENT EXTRACTS FOR PESTICIDE ANALYSIS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
D. F. Goerlitz, and L. M. Law.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 1, p 9-10, 1971. 2 p, 7 ref.

Descriptors: *Sulfur compounds, *Pesticides, *Insecticides, *Bottom sediments, Gas chromatography, Aldrin, Dieldrin, Heptachlor, DDT.
Identifiers: Lindane, Malathion, Methyl parathion, Parathion.

Extracts of bottom muds from lakes, streams, and estuaries are quite often very difficult to analyze for pesticides because of interfering co-extractives. Analysis of the interfering co-extractives by flame-photometric gas chromatography has revealed the presence of a number of sulfur containing compounds. Shaking of a small drop of metallic mercury with the concentrated extract apparently removes sulfur and sulfur-organic compounds by precipitation. Elemental sulfur is removed very rapidly, within 1 or 2 minutes whereas other sulfur compounds react more slowly with the metallic mercury. Preliminary findings indicate that aldrin, dieldrin, heptachlor, lindane, and p,p'-DDT are not affected by the addition or mercury to hexane solutions of the insecticides, even after 5 days in contact with the metal. Malathion, methyl parathion and parathion do react with mercury and removal of these compounds is noticeable after about 10 minutes. Recovery studies are now underway on bottom muds from various locations. (Josefson-USGS)
W71-07621

PERIODIC REPORT OF THE WATER QUALITY SURVEILLANCE NETWORK, 1965 THRU 1967 WATER YEARS.
New York State Dept. of Environmental Conservation, Albany.

New York State Department of Environmental Conservation Report, 1970. 390 p, 25 map, 5 append.

Descriptors: *Water quality, *New York, *Data collections, *Sampling, *Monitoring, Water analysis, Water chemistry, Chemical analysis, Solutes, Coliforms, Biochemical oxygen demand, Networks, Dissolved oxygen, Nutrients.
Identifiers: New York Water quality network.

The New York State Water Quality Surveillance Network for the period 1965-1967 consisted of 153 active surface water stations established within 17 principal drainage basins. These sampling stations were selected in an attempt to represent the varying qualities of the waters in each drainage basin. Chemical, bacteriological and physical parameters were routinely measured at the water quality surveillance sampling stations. A basic frequency of one (1) sample per month was arbitrarily established for each sampling point. A major phase of the water quality surveillance program is the storage and retrieval of all water quality data. Availability and use of electronic data processing equipment has been a primary factor in establishing a comprehensive water quality data library. Computer print-out listings of raw or summarized water quality data can be requested. (Knapp-USGS)
W71-07635

PROPYLENE CARBONATE EXTRACTION OF TRIS (PENTAN-2, 4-DIONE)-IRON (III) FROM AQUEOUS SOLUTION: APPLICATION TO THE SPECTROPHOTOMETRIC DETERMINATION OF IRON,
Wofford Coll. Spartanburg, S.C. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W71-07641

PESTICIDES IN SOIL,
Wisconsin Univ., Madison. Water Resources Center.
B. E. Frazier, G. Chesters, and G. B. Lee.
Pesticides Monitoring Journal, Vol 4, No 2, p 67-70, Sept 1970. 4 p, 3 fig, 2 tab, 5 ref. OWRR Project B-016-WIS (9).

Descriptors: *Gas chromatography, *Soil contamination, *Pesticide residues, Heptachlor, Aldrin.
Identifiers: Soil samples, Wisconsin, Indigenous soil components, Organochlorine insecticides.

A total of 34 soil samples taken in Wisconsin between 1909 and 1911 were extracted for organochlorine insecticides and analyzed by gas chromatography on 3 columns--a mixed QF-1/IV-17 column; a mixed QF-1/DC-200 column; and a diethylene glycol succinate column. The samples had been stored continuously since collection in tightly sealed glass jars and presumably were free of insecticide contamination. Of the 34 samples 32 showed some 'apparent' insecticide residues on at least one of the columns. Because peaks corresponding to particular organochlorine insecticides on chromatograms from one column did not recur on other columns, it was concluded that the peaks arose from co-extracted indigenous soil components. Peaks corresponding to haptachlor epoxide on the QF-1/OV-17 column and to aldrin on the QF-1/DC-200 column provided greatest interference in chromatographic determination. (Frazier-Wisc)
W71-07676

REMOVAL OF COLOR FROM THE WATER OF WAIKOLOA STREAM SOUTH KOHALA DISTRICT, ISLAND OF HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
Nathan C. Burbank, Jr., Po Lau Chan, and
Reginald H. F. Young.
Technical Report No 38, Mar 1970. 21 p, 10 fig, 1 tab, 5 ref.

Descriptors: *Water analysis, *Color, *Coagulation, *Zeta-potential.
Identifiers: *Organic color, *Color colloids, *Refractive color removal, Cationic polymer.

The waters of the streams in the South Kohala District on the island of Hawaii have long been noted for their extreme high color and at times a distinct peaty taste. Early attempts to treat this water have led to the conclusion that the color bodies occurring in the water were refractive in nature and very difficult to remove except by an uneconomic chemical treatment. Investigation, over a one-year period, has found the colored bodies in the water of the Waikoloa Stream to be predominantly organic in origin with the color colloid having a negative charge. The color of the water varies from a maximum value of 320 units to a minimum value of 22 units. The average value is about 80 units. The zeta potential of the color colloid has varied from neg tive 36 mv to negative 18.5 mv. It was possible remove color to the U. S. Public Health Servi standards for interstate carriers by coagulating t color bodies with either alum or ferric sulfa Coagulant aids can significantly reduce the quan ty of the coagulant required to effect co removal. Coagulant aids decrease the required tention time in the flocculation basin and effect faster rate of sedimentation. Further, color remo is generally improved. The most satisfactory coa lant aid is a cationic polymer, which not only a as an aid but also as a true coagulant in co removal. Reductions by as much as 20 percent the amount of primary coagulant required is po ble while obtaining the same results. The optim pH range is 6 to 7 and the optimum dosage of tionic polymer is from 1 to 3 mg/l in conjunct with 15 to 20 mg/l of coagulant. (Burbank-Hawa
W71-07680

5B. Sources of Pollution

FOOD CHAIN HYPOTHESIS ON THE ORIG OF MARINE TOXINS (IN JAPANESE),
Tokyo Univ. (Japan). a. of Marine Biochemistry
For primary bibliographic entry see Field 05C.
W71-07144

OCCURRENCE AND SIGNIFICANCE OF D AND DIELDRIN RESIDUES IN WISCON FISH,
Wisconsin Dept. of Natural Resources, Madison
For primary bibliographic entry see Field 05C.
W71-07147

STREAM QUALITY MODELING QUASILINEARIZATION,
Kansas State Univ., Manhattan. Dept. of Indust Engineering
For primary bibliographic entry see Field 06A.
W71-07187

FRENCH COASTS. GENERAL REVIEW CHEMICAL POLLUTANTS DISPOSED IN T SEA. LIST OF TOXICITY STUDIES. VO METHODOLOGY (COTES DE FRAN ETUDE GENERALE DES POLLUTIO CHEMIQUES, REJETEES EN MER. INV TAIRE ET ETUDES DE TOXICITE, TOM METHODOLOGIE),
Centre d'Etudes et de Recherches dc Biologi d'Oceanographic Medicale, Nice (France).
M. Aubert, J. Aubert, J. P. Gambarotta, B. Donnier, and M. Barelli.
Revue Internationale D'Oceanographic Medi Supplement, Tome 1, 1969. 72 p, 24 fig, 46 ref.

Descriptors: *Water pollution sources, *Pollut *Chemical wastes, Detergents, Industrial wa Pesticides, Oil, Physicochemical properties, To ty, Methodology
Identifiers: *Coasts of France.

General review of kinds and methodolog chemical pollution along the Mediterranean, lantic, English Channel and North Sea Coas France. Synthetic detergents, petroleum prod pesticides and industrial wastes were investig Physicochemical properties such as tempera salinity, pH and oxide reduction were meas along with the dosage of the polluting ag Techniques of cultures, breeding, food chain dies and methods of employing toxic products tested in vo. (See also W71-07190) (Ensign-
W71-07189

FRENCH COASTS. GENERAL REVIEW CHEMICAL POLLUTANTS, DISPOSED IN SEA. LIST OF TOXICITY STUDIES, VO MEDITERRANEAN SEA (COTES DE FRA ETUDE GENERALE DES POLLUTI CHEMIQUES, REJETEES EN MER. IN

IRE ET ETUDES DE TOXICITE, TOME II
DITERANEE),
ıtre d'Etudes et de Recherches de Biologie et
ceanographie Medicale, Nice (France).
Aubert, J. Aubert, J. P. Gambarotta, B.
nnier, and M. Barelli.
uc Internationale D'Oceanographie Medicale,
plement, Tome II, 1969. 135 p.

criptors: *Water pollution sources, *Pollutants,
emical wastes.
ntifiers: *Charts, *Graphs, *Tables, *Mediter-
ean.

toxicity of industrial waste water in the
diterranean is studied. Results of the techniques
obtaining samples, physicochemical analysis,
biological analysis are presented in charts,
phs and tables. (See also W71-07189) (Ensign-
)
1-07190

DROLOGIC IMPLICATIONS OF SOLID-
STE DISPOSAL,
ological Survey, Washington, D.C.
liam J. Schneider.
ilable free on application to the US Geological
vey, Wash, DC 20242. Geological Survey Cir-
ar 601-F, 1970. 10 p, 2 fig, 2 tab, 7 ref.

criptors: *Solid wastes, *Water resources,
ater pollution, *Waste disposal, Landfills, In-
eration, Garbage dumps, Sewage, Sewage ef-
nts, Industrial wastes, Wastes, Domestic wastes,
nicipal wastes, Water quality, Hydrologic cycle,
ter table.
ntifiers: *Solid waste disposal, Open dumps,
ne feed, Composting, On-site disposal.

he six principal methods of solid-waste disposal
general use today, four methods--open dumps,
itary landfill, incineration, and onsite disposal--
y an inherent potential for pollution of water
ources. Seepage of rainwater through the wastes
ches undesirable constituents which reach the
undwater in the area. This leachate is generally
h biologically and chemically contaminated.
extent of the pollution from this leachate is lar-
dependent upon the geologic environment in
ch the solid wastes are deposited. Pollution
ential is highest in permeable areas with a shal-
water table where the wastes are in direct con-
with the groundwater. In a relatively impreme-
area, the pollution is generally confined locally
he vicinity of the waste-disposal site. Regional
well as localized data on the water resources of
area are needed for planning adequate protec-
to the environment in general and the water
ources in particular. (Josefson-USGS)
1-07238

EANOGRAPHIC OBSERVATIONS AND
EORETICAL ANALYSIS OF OIL SLICKS
RING THE CHEVRON SPILL, MARCH 1970,
isiana State University, Baton Rouge. Coastal
dies Inst.
. Murray, W. G. Smith, and C. J. Sonu.
isiana State University Coastal Studies Institute
hnical Report No 87, Sept 30, 1970. 106 p, 34
6 tab, 37 ref, 2 append. ONR Contract No
0014-69-A-0211-0003. Project No NR 388 002.

criptors: *Louisiana, *Oily water, *Path of pol-
nts, Currents (Water), Winds, Stratified flow,
al effects, Tides, Water circulation, Theoretical
lysis, Diffusion, Dispersion, Mississippi River.
ntifiers: *Oil spills.

anographic observations were made in a study
the Chevron spilling well off the Mississippi
ta in March, 1970. Surface stress from the wind
most important; at speeds above 15 mph the
k orientation was generally determined by the
d direction. Both calculations and observations
wed that tidal currents produced an L-shaped
k geometry when winds were below about 15
h. The diurnal rotation of the tidal currents served to limit the excursion length of oil from the source, keeping it short of the nearest shore. The presence of fresh water from the Mississippi River in the surface layer and the consequent development of convergence lines often formed a natural barrier, preventing oil from encroaching upon the shore. Theoretical analysis using turbulent diffusion theory predicted that the area and length of a steady-state oil slick increased with oil discharge but decreased with the current speed and the lateral diffusion coefficient. Slick width increased with the rate of discharge and decreased with current speed but was independent of the diffusion coefficient. The width/length ratio of an oil slick, which was notably independent of current speed, was controlled only by the diffusion coefficient and the oil discharge. (Knapp-USGS)
W71-07245

SOURCES OF NITROGEN IN WATER SUPPLIES,
Geological Survey, Denver, Colo.
Marvin C. Goldberg.
In: Role of Agriculture in Clean Water: Iowa State University Press, Chapter 7, p 94-124, 1971. 31 p, 4 fig, 8 tab, 72 ref.

Descriptors: *Nitrogen, *Water pollution sources, *Path of pollutants, *Water chemistry, Farms wastes, Storm runoff, Urbanization, Sewage, Fertilizers, Industrial wastes, Municipal wastes, Soil erosion, Septic tanks, Nitrates, Soil water, Groundwater.
Identifiers: Nitrogen sources (Water pollution).

Sources of nitrogen to water supplies include atmospheric, geologic, biogenic, rural runoff, urban runoff, sewage, irrigation, return flow, animals, sinkholes, caves, feedlots, pollen, rural waste, industrial waste, pond waters, deforestation, and land stripping, among others. Generally, salts of nitrogen applied as fertilizer do not move either vertically or laterally to any significant extent. Nitrate in a nonsalt form seems to have higher soil infiltration capacity than salt nitrogen. This is dependent, however, upon the physical conditions of the soil and the hydrology of the region. In general, industrial waste, rural runoff (including agricultural land and nonagricultural land runoff), farm animal waste, and domestic waste are the dominant sources in surface waters. In groundwater supplies the usual sources of nitrogen are feedlots, privies, septic tanks, or other waste forms. (Knapp-USGS)
W71-07255

RUNOFF, SOLID WASTES, AND NITRATE MOVEMENT ON BEEF FEEDLOTS,
Agricultural Research Service, Lincoln, Nebr.; and Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
C. B. Gilbertson, T. M. McCalla, J. R. Ellis, O. E. Cross, and W. R. Woods.
Journal Water Pollution Control Federation, Vol 43, No 3, Part 1, p 483-493, Mar 1971. 11 p, 2 fig, 6 tab, 18 ref.

Descriptors: *Farm wastes, *Water pollution sources, *Path of pollutants, *Confinement pens, Runoff, Water quality, Nitrates, Groundwater, Surface waters, Water pollution, Industrial wastes.
Identifiers: *Feedlot wastes.

A study of the effect of feedlot slope and cattle densities on the quantity and quality of runoff resulting from rainstorms and snowmelt, the downward movement of pollutants into the soil profile on unpaved feedlots, and the amount of solids accumulation on the feedlot surface revealed that feedlots with 18.58 sq m/head yielded 5.6 metric tons dry matter/day/ha, whereas those with 9.29 sq m/head yielded 7.6 metric tons/day/ha. Feedlot slope had little effect. About 30 percent of the solids were volatile. Runoff quantity and quality depended more on rainfall than slope or cattle density, but high-density lots yielded 130 to 170 percent more winter runoff than low-density lots. Winter runoff averaged 6.2 to 17.6 metric tons/ha-cm, with about 50 percent volatile. Nitrate movement in soil after 1 yr was minimal. (Knapp-USGS)
W71-07258

T1-208 AND Na-24 GAMMA SOURCES FOR IDENTIFYING SOIL WATER TAGGED WITH DEUTERIUM,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 02G.
W71-07281

DISTRIBUTION OF MERCURY IN UNCONSOLIDATED SEDIMENTS FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
E. Joyce Kennedy, R. R. Ruch, and N. F. Shimp.
Illinois Geological Survey Environmental Geology Notes, No 44, Mar 1971. 18 p, 13 fig, 2 tab, 13 ref.

Descriptors: *Trace elements, *Heavy metals, *Bottom sediments, *Lake Michigan, Data collections, Chemical analysis, Sediments, Radiochemical analysis.
Identifiers: *Mercury.

The mercury content of 132 unconsolidated sediment samples from 31 sampling stations in southern Lake Michigan was determined by a radiochemical separation technique. In the deep central portion of the southern part of the lake and in areas west of Benton Harbor, Michigan, and southwest of Grand Haven, Michigan, mercury had accumulated (0.1 to 0.4 part per million) in the uppermost sediment layers. A base level of 0.03 to 0.06 ppm mercury was found at depth in the cores. In sandy areas along the southern and southwestern shores no accumulation of mercury was apparent near the surface of the sediments; an accumulation at a lower interval in these areas is believed to be associated with the presence of metal sulfides. Mercury concentrations in the sediment-water interface samples evidently vary with the organic carbon and total sulfur concentrations of the samples. (Woodard-USGS)
W71-07286

A NITROGEN GAS DISEASE CATASTROPHE,
Oregon Fish Commission, Clackamas; and Bureau of Commercial Fisheries, Astoria, Oreg.
For primary bibliographic entry see Field 05C.
W71-07342

AN INVESTIGATION OF ELEPHANT SEAL AND SEA LION MORTALITY ON SAN MIGUEL ISLAND,
Naval Undersea Research and Development Center, Point Mugu, Calif. Marine Bioscience Facility.
For primary bibliographic entry see Field 05C.
W71-07344

YEASTS ISOLATED FROM THE SOUTH SASKATCHEWAN, A POLLUTED RIVER,
National Research Council of Canada, Saskatoon, (Saskatchewan). Prairie Regional Lab.
For primary bibliographic entry see Field 05A.
W71-07389

SOURCES OF COMPOUNDS INTERFERING WITH THE ANALYSIS OF EXTRACTS FOR DIELDRIN AND DDT BY GLC,
Massachusetts Univ., East Wareham. Cranberry Experiment Station.
For primary bibliographic entry see Field 05A.
W71-07397

DYNAMICS OF NUTRIENT CONCENTRATIONS IN THE ILLINOIS RIVER,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 02H.
W71-07407

A POLYCHLORINATED BIPHENYL (AROCLOR 1254) IN THE WATER, SEDIMENT, AND BIOTA OF ESCAMBIA BAY, FLORIDA,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W71-07412

A COMPREHENSIVE APPRAISAL OF THE EFFECTS OF COOLING WATER DISCHARGE ON AQUATIC ECOSYSTEMS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
Arthur A. Levin, Thomas J. Birch, Robert E. Hillman, and Gilbert E. Raines.
Presented at the Public Affairs Workshop 'Why Nuclear Power', Hilton Head Island, South Carolina, Sept 13-16, 1970. 45 p, 9 fig, 2 tab, 137 ref.

Descriptors: *Power plants, *Thermal pollution, *Reviews, Water temperature, Dissolved oxygen, Bioindicators, E. coli, Aquatic algae, Sunfishes, Snails, Eels, Chinook salmon, Bass, Trout, Minnows, Crayfish, Mosquitoes, Food chain, Herring, Oysters, Clams, Columbia River, California, Washington, Connecticut, Florida, Delaware River, Indiana.
Identifiers: Barnacles, Flounder, Humboldt Bay, Connecticut River, San Joaquin River (California), Biscayne Bay, White River (Indiana), Patuxent River (Canada), Ontario.

A selective review was made of the literature, and based upon the information acquired, a comprehensive appraisal of the effects of cooling water discharge on freshwater and marine ecosystems is made. The aquatic organisms considered include fish, algae, diatoms, enteric bacteria, pathogens, snails, and larvae. (Little-Battelle)
W71-07417

AERIAL SURVEYS OF GREAT LAKES WATER TEMPERATURES, APRIL, 1966 to MARCH, 1968,
Department of Transport, Toronto (Ontario). Meteorological Branch.
T. L. Richards, J. G. Irbe, and D. G. Massey.
Climatological Studies, No 14, p 55, 1969. 93 fig, 11 ref.

Descriptors: *Water temperature, Meteorology, Surface waters, *Isotherms, *Remote sensing, Temperature, Water pollution sources.
Identifiers: *Great Lakes, *Airborne radiation thermometer, Aerial surveys.

This paper describes the instrumentation and technique and publishes the large mass of surface water temperature data collected by 82 Airborne Radiation Thermometers (A.R.T.) in survey flights conducted during two years over the Great Lakes. The temperature data are displayed in the form of analyzed isotherm patterns for each survey and diagrams showing the annual temperature regimes of each lake. Individual surveys and surface water temperature regimes of the lakes as they are related to meteorological factors and the physical characteristics of each lake are discussed. It is concluded that the most evident feature of the surveys is the influence of the depth contour pattern of each lake on the surface water temperature pattern. The relationship between isotherms and depth contour is apparent during both the warming and the cooling seasons. During spring the coldest water invariably remains close to the deep areas with the greatest warming taking place in the shallow nearshore parts of the lake. In autumn the temperature gradient is reversed. (Herrera-Vanderbilt)
W71-07419

BIOLOGICAL METHYLATION OF MERCURY IN AQUATIC ORGANISMS,
Stockholm Univ. (Sweden).
S. Jensen, and A. Jernelov.
Nature, Vol. 223, p 753-754, Aug 16, 1969. 6 ref.

Descriptors: *Path of pollutants, *Heavy metals, Metals, Organic compounds, Carbohydrates, Organic matter, Fish, Water pollution, Water quality, Aquatic animals, Water pollution sources.
Identifiers: Mercury, *Mercury pollution, *Methymercury.

Abnormally large amounts of mercury have been sometimes reported in Swedish fresh water fish. It was shown that the mercury was present almost entirely as methylmercury. Both mono- and dimethyl mercury can be produced in bottom sediments and in rotting fish. The formation of the volatile CH_3HgCH_3 may be a factor in the redistribution of mercury to the environment from aqueous industrial wastes. The tests were performed in an experimental aquarium and results were compared with data obtained from Lake Langsjon. (Novotny-Vanderbilt)
W71-07425

THE ESTUARINE VERSION OF THE COLHEAT DIGITAL SIMULATION MODEL,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
D. G. Daniels, J. C. Sonnishsen, and R. T. Jaske.
Battelle Memorial Institute, Atomic Energy Commission Research and Development Report BNWL-1342, UC-70, Richland, Washington, June 1970. 40 p, 25 fig, 7 ref.

Descriptors: *Thermal pollution, *Mathematical models, *Estuaries, *Simulation analysis, Tides, *Temperature, Flow, Flow characteristics, Distribution patterns, Mixing, Thermal powerplants, Water pollution sources.
Identifiers: *COLHEAT digital simulation model.

In order to predict the effects of dam and power plant construction on the temperature in rivers, Battelle's Pacific Northwest Laboratory had developed a river simulation temperature prediction system. The model-COLHEAT river simulation system-has frequently demonstrated its versatility and usefulness. Because many power plants are presently on or planned to be located on estuaries, a simulation model was developed to examine their effects. This model, which is called the estuarine version and is the subject of this report, is a special purpose version of the basic COLHEAT system which allows for volume changes owing to stage variations resulting from tidal action. Homogeneity in the vertical direction has been assumed and, therefore, specific treatment of mixing across the halocline has not been included. Reliable river flow, tidal information, and weather records are necessary to utilize the analysis. Application of the model to the lower Columbia River Estuary is shown. (Oleszkiewicz-Vanderbilt)
W71-07428

VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
Colorado Univ., Boulder. Dept. of Civil Engineering.
K. Daniel Linstedt, and Paul Kruger.
Journal American Water Works Association, Vol 61, No 2, p 85-88, Feb 1969. 2 fig, 3 tab, 4 ref.

Descriptors: *Heavy metals, *Trace elements, Path of pollutants, *Neutron activation analysis, *Colorado River basin, Water pollution sources, Analytical techniques, *Mine wastes.
Identifiers: *Vanadium, Uranium mills.

Vanadium is a trace element in water supplies which is of significance in water quality control research because of its possible physiological effects; for example, it has been shown at low intake levels to act in the inhibition of cholesterol synthesis. The success of the studies on vanadium concentrations in natural waters in the Colorado River basin was based on the specific development of a sensitive neutron activation analysis procedure which allowed for sensitivity of 0.1 micrograms of vanadium. Vanadium concentrations in samples throughout the Colorado River basin varied between 0.2 and 49.2 micrograms/liter over the 15-month period of the study. The lowest amounts of vanadium were found upstream from any industrial activity. Highest concentration values were found at the sampling sites in the vicinity of the uranium-vanadium milling operations. (Oleszkiewicz-Vanderbilt)
W71-07439

TRACE METAL CHARACTERIZATION IN AQUATIC ENVIRONMENTS BY ANODIC STRIPPING VOLTAMMETRY,
Bureau of Commercial Fisheries, Ann Arbor, Mich.
For primary bibliographic entry see Field 05A.
W71-07445

MERCURY-LAMP POLLUTION: HOW MUCH OF A PROBLEM.

Electrical World, Vol 175, No 4, p 100, Feb 15, 1971. 1 tab.

Descriptors: *Landfills, *Heavy metals, Leaching, Waste disposal, Water pollution sources, Public health.
Identifiers: *Mercury consumption, *Mercury lamp disposal, Sanitary landfill.

Annual mercury consumption in the United States is presented on the basis of date from 1969. Some 26.2% of the total 6,011,828 lbs. of mercury/year used for electrolytic preparation of chlorine and soda. The second major consumer is the electrical equipment industry (including lamps)-23.5%. The electrical equipment companies are concerned with the possible health hazards and environmental problems connected with the disposal of used lamps, as some 40-50 mg of mercury is used in a single typical 40-w 4 ft. or 75-w 8 ft. flourescent lamp. The Sylvania Electric Products, Inc. spokesman pointed out that proper location of the landfill tract would prevent the mercury from entering waterways. The Sylvania's calculations based on 205.5-million population and 2,000 lbs. of refuse per person per year have indicated that the mercury from lamps would produce a level of about 0.06 ppm when mixed with other refuse. The latter is reported to be close to the natural amount found in soil. (Oleszkiewicz-Vanderbilt)
W71-07449

POLLUTION FROM COMBINED SEWERS CINCINNATI, OHIO,
Arthur D. Caster, and William J. Stein.
Am Soc Civil Engrs Meeting, Preprint No 109, 1970. 39 p, 13 fig, 5 tab.

Descriptors: *Sewage, *Storm runoff, *Waste water treatment, Treatment facilities, Ohio.
Identifiers: *Combined sewer overflow, *Cincinnati (Ohio), Mill Creek basin.

The sampling and gaging program was designed to provide basic data to estimate the magnitude of combined sewage pollution in and from the Mill Creek Basin, and by extrapolation, the Cincinnati Service Area. The description of the Service Area, the background hydrological and water quality data, the field investigation program, the analysis of the data, and conclusions are presented herein.
W71-07525

ANIMAL WASTE REUSE--NUTRITIVE VALUE AND POTENTIAL PROBLEMS FROM FEED ADDITIVES--A REVIEW.
Agricultural Research Service, Beltsville, Md. Animal Science Research.
For primary bibliographic entry see Field 05G.
W71-07542

THE MICROBIOLOGY OF BUILT-UP POULTRY LITTER,
Edinburgh Univ. (Scotland). Dept. of Bacteriology
For primary bibliographic entry see Field 05D.

71-07548

ECYCLING AND UTILIZATION OF
IODEGRADABLE WASTES IN THE SOIL,
utgers-The State Univ., New Brunswick, N.J.
ept. of Agricultural Engineering.
r primary bibliographic entry see Field 05D.
71-07557

LVER-108m IN BIOTA AND SEDIMENTS AT
KINI AND ENIWETOK ATOLLS,
ashington Univ., Seattle. Lab. of Radiation
ology.
M. Beasley, and E. E. Held.
ature, Vol 230, No 5294, p 450-451, Apr 16,
71. 2 p, 1 tab, 4 ref.

escriptors: *Radioactive dating, *Sediments,
iota, *Pacific Ocean, Nuclear explosions, Fal-
ut, Sampling, Methodology.
entifiers: *Silver radionuclide (Ag-108m).

e occurrence of the long lived silver
dionuclide Ag-108m in biota from the Pacific
ean suggests that the silver radionuclide ratio
g-110m/Ag-108m may be useful as a tracer of en-
onmental processes. It also appears that large
ounts of Ag-110m and Ag-108m were not
oduced during the 1958 Nuclear test series or
rlier, and that the production activity radio Ag-
0m/Ag-108m was 162, a ratio derived solely
om the termal neutron activation of stable silver.
e radionuclide was first detected in a composite
mple of the hepatopancreases of spiny lobsters
llected at Bikini Atoll in 1969, and its concentra-
n has since been measured in several samples
om Bikini and Eniwetok Atolls. Gamma-ray spec-
were made using both NaI (TI) and a solid state
(Li) detector system. Comparison of the con-
ntrations of Ag-108m in the hepatopancreas of
ny lobsters shows that the Bikini specimens con-
n 2 to 3 times more Ag-108m than those from
iwetok Atoll. (Woodard-USGS)
71-07600

OCHEMICAL MODEL FOR THE BIOLOGI-
AL METHYLATION OF MERCURY SUG-
ESTED FROM METHYLATION STUDIES IN
VO WITH NEUROSPORA CRASSA,
edish Water and Air Pollution Research Lab.,
ckholm.
rs Landner.
ature, Vol 230, No 5294, p 452-453, Apr 16,
71. 2 p, 3 tab, 11 ref.

escriptors: *Water pollution sources, *Heavy
etals, *Synthesis, Biochemistry, Biological pro-
rties, Chemical properties, Vitamins.
entifiers: *Mercury, Synthesized methyl mercu-

nce the discovery of methyl mercury formation in
ce sediments contaminated with inorganic or
enyl mercury, there has been a good deal of
eculation about the mechanism of this synthesis.
e process involving methyl-cobalamin (a B12-
rivative) was demonstrated in cell-free extracts
methanogenic bacteria. Since vitamin B12 is not
own to be involved in the metabolism of Neu-
spora, the biosynthesis of methyl mercury in this
ganism, where the pathway should be different,
s investigated. The possibility that the methyla-
n of mercury in vivo is achieved by means of a
ect transmethylation involving methionine or S-
enosyl-methionine seems less likely on the
dence provided by preliminary experiments with
urospora (unpublished results of A. Jernelov
d L. Landner and personal communication with
Kitamura). In no case was an increased yield of
thyl mercury found when L-methionine was
ded to the HgC12-containing medium.
71-07601

OBLEMS IN THE DETERMINATION OF
DIUM NITRILOTRIACETATE IN SEWAGE
D EFFLUENT LIQUORS,
ilever Ltd. (England). Port Sunlight Lab.

For primary bibliographic entry see Field 05A.
W71-07607

MICROBIAL DEGRADATION OF THE HERBICIDE ATRAZINE AND ITS 2-HYDROXY ANALOG IN SUBMERGED SOILS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
Kishore P. Goswami, and Richard E. Green.
Environmental Science and Technology, Vol 5, No 5, p 426-429, May 1971. 4 p, 4 fig, 2 tab, 16 ref.

Descriptors: *Biodegradation, *Herbicides, *Aquatic soils, *Bottom sediments, Tracers, Tagging, Path of pollutants, Pesticide kinetics, Carbon radioisotopes, Hydrolysis, Chromatography.
Identifiers: *Atrazine.

Soil-applied pesticides transported by erosion from the site of application to waters and sediments are subject to conditions sufficiently different from those of aerated soils to alter pesticide persistence. Microbial degradation of atrazine and its 2-hydroxy analog (hydroxyatrazine) in submerged soils was studied by measurement of C-14 in evolved C02 and chromatographic separation of metabolites in soil extracts. Chemical hydrolysis of atrazine to hydroxyatrazine is the principal pathway of detoxication in soil and is conductive to ring cleavage and total breakdown by microbes. Biological dealkylation without dehalogination occurs simultaneously. Total breakdown of atrazine should be slower in submerged sediments than in aerated soils because of the higher pH and restricted aeration of sediments. (Knapp-USGS)
W71-07619

PERIODIC REPORT OF THE WATER QUALITY SURVEILLANCE NETWORK, 1965 THRU 1967 WATER YEARS.
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05A.
W71-07635

SOURCE CONTROL OF URBAN WATER POLLUTION,
Florida Univ., Gainesville. Dept of Engineering and American Public Works Association, Chicago, Ill. Technical Services.
For primary bibliographic entry see Field 05G.
W71-07642

MERCURY IN THE ENVIRONMENT,
Duke Univ., Durham, N.C.; and North Carolina Univ., Chapel Hill. School of Public Health.
Leonard J. Goldwater.
Scientific American, Vol 224, No 5, p 15-21, May 1971. 7 p, 7 fig, 1 tab.

Descriptors: *Pollutant identification, *Heavy metals, *Environmental effects, *Water pollution, *Air pollution, Industrial wastes, Soils, Vegetation, Chemical reactions, Fish, Sediments, Reviews, Ecosystems, Foods, Pollutants.
Identifiers: *Mercury, *Mercury pollutants.

Mercury cycle disperses the metal through the lithosphere, hydrosphere and atmosphere and through the biosphere, which interpenetrates all three. Mercury is present in all spheres in trace amounts, but it tends to be concentrated by biological processes. Man's activities, in particular certain industrial processes, may now present a threat by significantly redistributing the metal. Methyl mercury compounds are the most injurious ones. Mercury discharged into water in various forms can be converted by bacteria in detritus and sediments into methyl and dimethyl mercury. Phenyl mercurials, metallic mercury and methoxyethyl mercury are converted into methyls primarily through ionic mercury. Major use of mercury has been as a cathode in the electrolytic preparation of chlorine and caustic soda. In this process a large inventory of mercury is continuously recycled, but in 1968, 23 percent of total mercury demand still went to make up what was wasted. Another 10 percent went for start-up of new plants. Since then legislation and lawsuits have required manufacturers to increase recycling sharply, reducing emissions to the environment. (Woodard-USGS)
W71-07646

ENVIRONMENTAL MERCURY RESEARCH IN SWEDEN,
Swedish Environment Protection Board, Stockholm.
J. E. Larson.
Swedish Environment Protection Board, Stockholm, June 1970. 3 fig, 4 tab, 56 ref.

Descriptors: *Heavy metals, Water pollution, Water pollution effects, Metals, Environmental engineering, Air pollution, Human diseases, Public health, Waste disposal, Human pathology, Animal pathology, Toxicity, Water quality, Industrial wastes, Water pollution sources, *Lethal limit.
Identifiers: *Mercury pollution, Mercury.

The history of the mercury pollution problem is presented, followed by an account of the research which was initiated as a consequence. Decisions of the administrative authorities with regard to allowable concentrations within the mercury field are reported together with the effects of these decisions and measures. The demands for research and corrective measures in order to reduce the deleterious effects as a result of mercury contamination of the environment are described. An economic outline of the research efforts is given in schematic form. Particular attention is paid to the water environment. (Novotny-Vanderbilt)
W71-07664

WATER RESOURCES ACTIVITIES IN THE UNITED STATES-POLLUTION ABATEMENT.
For primary bibliographic entry see Field 06E.
W71-07674

A DISSOLVED OXYGEN PRECICTION MODEL FOR A LONG RIVER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05C.
W71-07677

WATER UTILIZATION AND WASTE CONTROL IN THE TEXTILE INDUSTRY,
North Carolina State Univ., Raleigh. School of Textiles.
For primary bibliographic entry see Field 05D.
W71-07679

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.
For primary bibliographic entry see Field 05G.
W71-07697

SUMMARY OF INTERIM GUIDELINES FOR DISPOSAL OF SURPLUS OR WASTE PESTICIDES AND PESTICIDIE CONTAINERS.
Working Group on Pesticides, Washington, D.C.

Available from the National Technical Information Service as PB-197 147, $3.00 in paper copy, $0.95 in microfiche. Working Group on Pesticides Report DS-1, Wash, DC, Dec 1970. 25 p.

Descriptors: *Pesticides, *Waste disposal, *Insecticides, *Water pollution, Water supply, Land fills, Injection wells.
Identifiers: Incinerators, Hazardous materials, Hydrology, Agricultural wastes, Industrial wastes, *Solid waste disposal, Sanitary landfills.

An interim guideline for surplus or waste pesticides and pesticide container disposal has been drawn

from the combined important points of three Working Group reports, Ground Disposal of Pesticides: The Problem and Criteria for Guidelines; Proceedings of National Working Conference on Pesticide Disposal; and Information Available on Handling Surplus Pesticides, Empty Containers and Emergency Situation. Presented in concise form for ready reference, the subjects of ocean disposal (not recommended), ground disposal and incineration (air disposal) are reviewed. Orientation as to different pesticide users: householders, farm operators, commercial operators, governmental authorities, industrial users, formulators, manufacturers. Ground disposal, its attendant precautions and controls, are discussed as well as methods and disposal site requirements. Incineration technology to date is outlined as the most applicable method of disposal for large amounts of toxic wastes and unusable pesticides. Sections on collection systems as practiced and recommended in various areas including transportation of surplus pesticides and containers, storage considerations with fire and safety precautions, disposal site monitoring and suggested research bring the whole problem into focus. The summary of guidelines provides preliminary guidance with expectation of revision when more definitive solutions are available. Not a set of specific recommendations on disposal.
W71-07699

PROCEEDINGS OF THE NATIONAL WORKING CONFERENCE ON PESTICIDE DISPOSAL, AT NATIONAL AGRICULTURAL LIBRARY, BELSVILLE, MARYLAND, JUNE 30 and JULY 1, 1970.
Working Group on Pesticides, Washington, D.C.

Available from the National Technical Information Service as PB-197 145, $3.00 in paper copy, $0.95 in microfiche. Working Group on Pesticides, Report DR-2, Wash, DC, Sept 1970. 139 p.

Descriptors: Landfills, Solid wastes, Water pollution, *Pesticides, *Waste disposal, *Insecticides, *Herbicides, *DDT, Fungicides.
Identifiers: *Incinerators, Hazardous materials, Decontamination, Waste recycling, *2-4-5-T herbicide.

The report is a volume of collected papers delivered before the National Working Conference on Pesticide Disposal by federal, state and industrial officials knowledgeable in various aspects of pesticide disposal; Reports from the Chemical Specialties Manufacturers Association and the National Agricultural Chemicals Association provide industry input; Container size and type, and farmers' use of pesticides and pesticide containers are discussed by the U.S. Department of Agriculture. Reports on Connecticut Florida, Massachusetts, Michigan and Wisconsin are given by officials from these states and programs in the other states are summarized by the National Association of State Departments of Agriculture. Considerations Preliminary to Development of a Waste Pesticide Management System, recall and disposal problems caused by the suspension of 2,4,5-T, Department of Transportation regulations on hazardous materials, Department of Defense disposal program and Air Pollution Problems of Pesticide Disposal are presented by federal and industrial officials. Research on incineration technology, necessary conditions for proper decontamination and combustion of organic pesticides and pesticide containers, and the application of solid waste research to pesticide disposal are reported by university, industry and federal researchers. Information and education programs, and federal coordination are reivewed by federal education and information specialists.
W71-07700

GROUND DISPOSAL OF PESTICIDES: THE PROBLEM AND CRITERIA FOR GUIDELINES.
Working Group on Pesticides, Washington, D.C.

Available from the National Technical Information Service as PB-197 144, $3.00 in paper copy, $0.95 in microfiche. Working Group on Pesticides Report DR-1, Wash, DC, Mar 1970. 54 p.

Descriptors: Waterwells, Water supply, Injection wells, Landfills, Lagoons, Sewers, Solid wastes, Aquifers, *Pesticides, *Waste disposal, *Insecticides, *Herbicides, *Water pollution, Groundwater.
Identifiers: Pesticides, Agricultural wastes.

A document that states the problem of ground disposal of pesticides, and examines the extent to which contamination occurs in wells and groundwater, discusses the types of pesticide wastes, and considers interactions between pesticides and soils and pesticides and groundwater. It looks into sources of pesticides to be disposed of, describes methods of ground disposal, develops criteria for decision to dispose of pesticide wastes to the subsurface the selection of a disposal zone including a decision matrix, and summarizes disposal site maintenance and monitoring criteria. It concludes with proposed industrial guidelines for pesticide waste disposal. States that the magnitude of contamination threat to groundwater resources from improper ground disposal is dependent upon the physical, chemical, biological and toxicological properties of the pesticidal waste, the hydrogeological characteristics of the disposal site and the volume, state (liquid or solid) and persistence of the waste. The well-developed technology of occurrence and movement of groundwater should be applied to each individual disposal site, to the type of pesticide wastes and to the method under consideration. Nine recommendations on the problem are offered.
W71-07701

5C. Effects of Pollution

EFFECT OF LAGOON EFFLUENT ON A RECEIVING STREAM,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 05D.
W71-07097

EFFECTS OF OXIDATION POND EFFLUENT ON RECEIVING WATER IN THE SAN JOAQUIN RIVER ESTUARY,
Federal Water Quality Administration, Pacific Southwest Region, California/Nevada Basins Office.
For primary bibliographic entry see Field 05D.
W71-07098

ON THE USE OF PHOSPHAMIDON FOR ERADICATION OF FRESH WATER FISH PREDATORS,
Bihar Univ., Muzaffarpur (India). Dept. of Zoology.
U. S. Srivastava, and S. K. Konar.
Summary in German. Experientia, Vol 21, No 390, p 1-3, 1965. 1 tab, 2 ref.

Descriptors: *Pesticide toxicity, *Bioassay, *Fish control agents, *Insect control, Mortality, Fish management, Fish farming, Fish establishment, Carp, Predators, Fish toxins, Lethal limit, Insecticides, Chemcontrol.
Identifiers: *Phosphamidon, *Fish predators, Labeo rohita.

The effectiveness of using the insecticide phosphamidon to control predatory fishes and aquatic predatory insects from fish nursery and rearing ponds, without causing damage to the fish being raised, was determined. Bioassays were conducted to determine the minimum lethal doses of phosphamidon on the test fish and insects. All insect predators were unable to survive even as low a concentration as 10 ppm or lower. Most insect predators can be eradicated from freshwater reservoirs without effecting the fish population, and by employing 100-125 ppm of phosphamidon, most of the predatory fish can also be removed. (Sjolseth-Washington)
W71-07138

LABORATORY STUDIES ON TWO ORGANOPHOSPHOROUS INSECTICIDES, DDVP AND PHOSPHAMIDON, AS SELECTIVE TOXICANTS,
Kalyani Agriculture Univ. (India). Dept of Zoology.
S. K. Konar.
Transactions of the American Fisheries Society, Vol 98, No 3, p 430-437, 1969. 4 tab, 15 ref.

Descriptors: *Bioassay, *Fish food organisms, *Fish control agents, Carp, Toxicity, Organophosphorous pesticides, Fish management, Laboratory tests, Water pollution effects, Aquatic insects, Fish farming, Persistence, Hydrogen ion concentration, Turbidity, Resistance, Phytoplankton, Zooplankton, Eels.
Identifiers: Labeo rohita, *DDVP, *Phosphamidon, *Selective toxicants, Tolerance, Susceptibility, Detoxification.

The cultivated carp, Labeo rohita, showed greater tolerance of both DDVP and phosphamidon than nearly all of twelve undesirable fish species and all of nine predacious aquatic insects tested, so that both of these toxicants exhibited conveniently selective activity. Variations of pH between 5.8 and 8.8, and of turbidity between 125 and 1000 ppm had little or no influence on the toxicity of DDVP. The toxicity of phosphamidon was reduced slightly in acidic water and more markedly in turbid water. Phytoplankters are more resistant to DDVP and to phosphamidon than are zooplankters. The most important food organisms, as well as the predacious insects, are much more susceptible to these insecticides than are the tested fishes. The toxicity of phosphamidon appears to be more persistent than that of DDVP. (Sjolseth-Washington)
W71-07140

PESTICIDES IN HATCHERY TROUT--DIFFERENCES BETWEEN SPECIES AND RESIDUE LEVELS OCCURRING IN COMMERCIAL FISH FOOD,
Pennsylvania State Univ., University Park. Pesticide Research Labs.
For primary bibliographic entry see Field 05A.
W71-07141

CHLORINATED PESTICIDE RESIDUES IN AN AQUATIC ENVIRONMENT LOCATED ADJACENT TO A COMMERCIAL ORCHARD,
Wisconsin Dept. of Agriculture, Madison.
For primary bibliographic entry see Field 05A.
W71-07142

POSSIBLE SELECTIVE MECHANISMS IN THE DEVELOPMENT OF INSECTICIDE-RESISTANT FISH,
Mississippi State Univ., State College. Dept. Biology.
Mack T. Finley, Denzel E. Ferguson, and J. Larry Ludke.
Pesticides Monitoring Journal, Vol 3, No 4, p 21-218, 1970. 2 fig, 4 tab, 14 ref. USPHS Grants 00086 and FD-00134-01.

Descriptors: *Resistance, *Runoff, *Pesticide residues, *DDT, Bioassay, Fishkill, Gas Chromatography, Selectivity, Mississippi, Water pollution sources, Water pollution effects, Pesticide kinetics, Mosquito fish, Sunfishes, On-site investigations, Toxicity, Chlorinated hydrocarbon pesticides.
Identifiers: *Selective mechanisms, *Insecticide resistant fish, *Toxaphene, DDD, DDE, Susceptibility.

Results of bioassays and gas chromatographic analyses show that populations of insecticide-

stant fish from near heavily treated cotton fields Belzoni, Miss., are subjected to relatively brief ir-gular periods of selection after rains. Runoff from tton fields increased mortality among caged sceptible and native resistant fish. Feeding of en-in-exposed and field-collected resistant osquitofish (Gambusia affinis) to resistant and sceptible green sunfish (Lepomis cyanellus) owed that selective pressure from residues in the od chain was minimal, compared with direct ex-sure, provided the consumer was resistant. Live-ge bioassays at top and bottom depths revealed insecticide stratification in the water. Residue alyses revealed DDT and toxaphene as the two secticides of selective importance. DDT and tox-hene residues increased in whole fish and water mples after runoff. High DDT values, compared th those of DDD and DDE, suggested recent con-mination. (Sjolseth-Washington)
71-07143

OD CHAIN HYPOTHESIS ON THE ORIGIN F MARINE TOXINS (IN JAPANESE),
kyo Univ. (Japan). a. of Marine Biochemistry.
oshiro Hashimoto, and Hisao Kamiya.
lletin of the Japanese Society of Scientific Fishe-s, Vol 36, No 4, p 425-434, 1970. 8 fig, 59 ref.

escriptors: *Food chains, *Toxins, *Toxicity, oisons, *Phytotoxicity, *Path of pollutants, Red e, Shellfish, Gastropods, Crustaceans, Fish, Car-rs, Phytoplankton, Dinoflagellates, Pathology, ology, Physiological ecology.
entifiers: Paralytic shellfish poison, Venerupin, guatera, Saxitoxin, Aluterin, Tetrodotoxin, toxification.

e hypotheses on transport of toxins through rine food chains are reviewed. The transfer of itoxin (paralytic shellfish poisoning) from oflagellates to shellfish is considered to be the ly satisfactorily established example. Similarly, guatoxin is the only example considered to pass rough several trophic levels without modifica-n. Some species apparently contain several tox-concurrently, indicating a complex relationship tween food webs and the passage of toxins rough them. Passage of poisons through food ains should be proposed only cautiously, as reign substances are usually metabolized or idly excreted by detoxification mechanisms in ganisms. More data are required to substantiate food chain hypothesis. (LeGore-Washington)
71-07144

FFECTS OF TEMPERATURE ON SERUM OTEIN COMPONENTS IN THE KILLIFISH, NDULUS HETEROCLITUS,
ncinnati Univ., Ohio. Dept. of Biological ences.
uce L. Umminger.
urnal of the Fisheries Research Board of Canada, l 27, No 2, p 404-409, 1970. 1 fig, 2 tab, 24 ref.

escriptors: *Water pollution effects, *Fish ysiology, *Electrophoresis, *Acclimatization, ter temperature, Killifishes, Proteins, Laborato-tests.
entifiers: *Serum protein components, *Fundu-heteroclitus, *Electrophoretic patterns, Tem-rature effects, Gamma globulins, Beta globulins, umins, Alpha globulins, Susceptibility.

ectrophoretic patterns of serum proteins were died in Fundulus heteroclitus acclimated to tem-ratures from 30 to -1.5C. Microzone elec-phoresis on cellulose acetate revealed eight tinct zones (seven anodal and one cathodal to origin) at all temperatures. These zones were uped into three larger zones (I, II and III) for nvenience in analysis. Low mobility proteins of e III decreased in the cold to a greater degree n did high mobility proteins of zones II and I. e greater reduction in these low mobility teins, which are comparable to human gamma bulins, might produce a less active immune ponse in cold-acclimated killifish. (Sjolseth-shington)

W71-07145

EFFECTS OF POLYSTREAM AND DRILLEX ON OYSTER SETTING IN CHESAPEAKE BAY AND CHINCOTEAGUE BAY,
Bureau of Commercial Fisheries, Oxford, Md. Biological Lab.
William N. Shaw, and George T. Griffith.
National Shellfisheries Association 1966 Proceedings, Vol 57, p 17-23, June 1967. 1 fig, 4 tab, 4 ref.

Descriptors: *Oysters, *Evaluation, *Growth rates, *Toxicity, *Chlorinated hydrocarbon pesticides, Commercial shellfish, Spawning, On-site investigations, Antifouling materials, Fouling, Water pollution effects, Pest control, Cultural control, Chem-control, Organic compounds, Aquiculture, Chemicals.
Identifiers: *Polychlorinated benzenes, *Benzene, *Polystream, *Drillex, *Oyster setting, *Spawning success, Chesapeake Bay, Chincoteague Bay, Sevin, Cultch, Chlorinated benzenes.

The possibility of increasing the yield of oyster spat, Crassostrea virginica, in Chesapeake and Chincoteague Bays by treating shells with Polystream or with Drillex was tested during 1963. Field studies were also conducted in Watts Bay, Virginia, to determine if the use of Drillex-treated sand in combination with Polystream-treated shells increased oyster setting. Significantly more oysters were caught on both Polystream-treated and on Drillex-treated shells than on untreated shells when they were suspended either in the intertidal zone or placed on the bottom of Chincoteague Bay, and off the bottom in the Tred Avon River. Although in many cases more oysters were caught on chemically-treated shells, Polystream and Drillex apparently did not repel the principal fouling organisms in Chincoteague and Chesapeake Bays. In Watts Bay, setting was greater on plots with Polystream-treated shells and with Drillex-treated sand than on either control plots (untreated shells only) or on plots with just Polystream-treated shells. (Sjolseth-Washington)
W71-07146

OCCURRENCE AND SIGNIFICANCE OF DDT AND DIELDRIN RESIDUES IN WISCONSIN FISH,
Wisconsin Dept. of Natural Resources, Madison.
Stanton J. Kleinert, Paul E. Degurse, and Thomas L. Wirth.
Wisconsin Department of Natural Resources Technical Bulletin No 41, 1968. 43 p, 2 fig, 3 tab, 49 ref. Wisc Conservation Commission Grant, and US Bureau of Sport Fisheries and Wildlife Funds.

Descriptors: *DDT, *Dieldrin, *Pesticide residues, *Chlorinated hydrocarbon pesticides, Wisconsin, Water pollution effects, Water pollution sources, On-site data collections, Pesticide toxicity, Freshwater fish, Public health, Analytical techniques, Gas chromatography, Pesticide kinetics, Pesticide removal, Fish reproduction, Pest control, Monitoring, Control.
Identifiers: DDD, DDE, Spraying, Recommendations.

Five hundred fifty-five whole fish samples representing 2,673 fish of 35 species were collected from 109 inland lakes and streams of Wisconsin and analyzed for DDT and Dieldrin residues. All of the fish samples contained DDT and 70% contained Dieldrin. DDT levels ranged from 0.222 to 534.6 ppm and averaged 27.15 ppm. Dieldrin levels ranged from 0.026 to 670.2 ppm and averaged 6.15 ppm. These values were expressed relative to the 'fat basis.' Immediate and long-term concerns of the significance of DDT and of Dieldrin residues were discussed. Specific recommendations were listed in an effort to reduce the future threat imposed by the use of persistent pesticides. (Sjolseth-Washington)
W71-07147

THE INFLUENCE OF OXYGEN TENSION ON THE PRESSURE RESISTANCE OF SOME MARINE INVERTEBRATES (In German),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
H. Theede, and A. Ponat.
Marine Biology, Vol 6, No 1, p 66-73, May 1970. 5 fig, 4 tab, 43 ref.

Descriptors: *Resistance, *Hydrostatic pressure, *Invertebrates, *Animal physiology, *Animal metabolism, *Mode of action, Water pollution effects, Mussels, Dissolved oxygen, Laboratory tests, Hydrogen ion concentration, Respiration, Environmental effects, Biochemistry, Enzymes, Inhibition, Oxygen, Oxygenation, Oxygen requirements, Marine animals.
Identifiers: *Oxygen tension, *Pressure resistance, Lactic acid, Cyanide.

Variations in oxygen tension exert a considerable influence on the resistance of invertebrates to high hydrostatic pressure. Pressure resistance of whole animals (Idotea baltica, Cyprina islandica) and of isolated tissues (gill tissues of C. islandica and Mytilus edulis) is higher in a medium not fully air saturated; it decreases with increasing oxygen tension to about air saturation or higher. In some spp. pressure resistance decreases when D.O. is almost absent. Oxygen tension influences pressure resistance not only during exposure to increased pressure, but pressure resistance increases in isolated tissues kept under oxygen deficiency prior to the experiment. Lactic acid, a result of anaerobic glycolysis, increases cellular pressure resistance only if its presence is combined with decreased pH values. Metabolic inhibition with cyanide does not increase pressure resistance. It is suggested that the primary reasons for lowered pressure resistance at saturation or higher oxygen levels are oxidation and inhibition of sensitive thiol enzymes under pressure. Decrease of pressure resistance at extreme degrees of oxygen deficiency may be caused by insufficient rates of ATP synthesis. (Sjolseth-Washington)
W71-07149

EFFECT OF LOW DISSOLVED OXYGEN CONCENTRATIONS ON THE VENTILATION RHYTHM OF THREE TUBICOLOUS CRUSTACEANS, WITH SPECIAL REFERENCE TO THE PHENOMENON OF INTERMITTENT VENTILATION,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
J. C. Gamble.
Marine Biology, Vol 6, No 2, p 121-127, June 1970. 8 fig, 32 ref.

Descriptors: Ventilation, Behavior, *Amphipoda, *Crustaceans, Invertebrates, Animal physiology, *Dissolved oxygen, Respiration, Oxygen requirements.
Identifiers: Pleopods, Peracaridean, Corophium sp., Marinogammarus sp., Tanais sp., Tubicolous crustaceans.

The pleopod ventilatory activity of the tube-dwelling amphipods, Corophium volutator and C. arenarium is intermittent. Unlike the free-living amphipod Marinogammarus obtusatus, which increases its rate of pleopod beating, the pleopod beat rate of both Corophium spp. is unaffected by low oxygen concentrations. However, the nature of the intermittent ventilation rhythm is altered so that, at low D.O., the pleopods of Corophium beat almost continuously. It is suggested that the intermittent ventilation of Corophium can be interpreted as an adaptation to a tubicolus existence. The peracaridean Tanais chevreuxi has 2 independent ventilatory systems, the maxilliped epipodites and the pleopods. The former, which respond to low D.O., are thought to be the principal respiratory organs of T. chevreuxi, while the pleopods, which show no response to low D.O., are believed to be primarily concerned with filter feeding. (Wahtola-Washington)
W71-07150

ENVIRONMENTAL CONSIDERATIONS IN THE RECYCLING OF HIGH TEMPERATURE WATER,
Department of the Interior, Washington, D.C.
Lewis Orme, Jr.
Proceedings, 14th Annual Arizona Watershed Symposium, Phoenix, Sept 23, 1970, p 27-30, 1971. 3 fig, 1 tab.

Descriptors: *Thermal pollution, *Water Quality Act, *Environmental effects, *Temperature control, *Pollution abatement, Towers, Arid lands, Thermal powerplants, Thermal stress, Arizona, Economic feasibility, Water assimilative capacity, Water quality.

About 95% of all precipitation in Arizona is consumed by evaporation or transpiration. Also, the major river, the Colorado, is high in both salts and silt. However, water pollution is not currently a major problem in the state. Of all the potential pollution problems, the author considers thermal pollution the least understood. The U.S. is the world's highest energy consuming country, and consumption is doubling every ten years. It is estimated that within 20 years, 95% of all power generation will be thermal, and within 30 years, 1/2 - 1/3 of the average daily fresh water runoff in the U.S. will be used to cool electric power stations, raising its temperatures 10-20 deg in the process. In heated waters, oxygen content decreases, which together with higher temperature, decreases the viability of equatic organisms and lowers the capacity of the stream to assimilate other wastes. Fortunately, the Federal Water Quality Act of 1965 set federal-state guidelines for control of thermal pollution and this was subsequently implemented by appropriate legislation in Arizona. Thermal pollution control measures are available, but their use is complicated by economic factors. The best technique, dry closed system towers, is also the most expensive. Rigorous planning is necessary to assure environmental quality in the process of increasing power production. (Casey-Arizona).
W71-07161

TEMPERATURE EFFECTS ON BIOLOGICAL WASTE TREATMENT PROCESSES,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 05D.
W71-07321

THERMAL EFFECTS FROM STEAM-ELECTRIC POWER PLANTS,
American Institute of Chemical Engineers, Nuclear Engineering Division.
W. P. Bebbington.
For sale by Superintendent of Documents, US Govt Printing Office, Washington, DC, 20402, Price $3.50. Hearings before the Joint Committee on Atomic Energy, Congress of the United States on Environmental Effects of Producing Electric Power, Part 2, Vol 2, p 2463-2467, Jan 27-30, Feb 24-26, 1970. 1 tab, 2 ref.

Descriptors: *Powerplants, *Thermal pollution, Efficiencies, Safety, Cooling water, Radioactivity, Water pollution effects.
Identifiers: Nuclear, Fossil-fuel, Waste heat.

National average of heat rate and heat to environment of a fossil-fueled, steam-electric generating plant is 10432 and 6848 Btu per kw-hr respectively. Ordinarily about a third of the heat released to the environment by a fossil-fueled plant is by way of the stock and two-thirds by way of the condenser. In the nuclear plant all of the heat released to the environment is by way of the condenser cooling water. Average heat absorbed from the sun by the earth's surface is about 1000 megawatts per square mile. Nuclear power plants emit a slight amount of radioactivity. Fossil-fueled plants emit gaseous products of combustion and fly ash. The choice between nuclear fuel and fossil should be based on local situation such as cost of fuel, population density, water supply, etc. (Upadhyaya-Vanderbilt)
W71-07324

THERMAL EFFECTS OF ELECTRIC POWER PLANTS,
Pacific Gas and Electric Company, Emeryville, California.
James R. Adams.
Proceedings of the Joint Committee on Atomic Energy hearings on Environmental Effects of Producing Electric Power, Feb 24-26, 1970, Wash, DC.

Descriptors: *Thermal pollution, *Thermal power plants, Fish, Temperature, Aquatic life, Biota, California, Estuaries, Marine fish, Ecology, Aquatic habitats, Water pollution, Water quality, Path of pollutants, Pacific Coast Region, Water pollution effects.
Identifiers: Temperature effects.

The effect of thermal power stations on aquatic life and water quality have been extensively studied. Screens and intake structures have been extensively studied. Screens and intake structures have been designed which keep the large fish out of the cooling water system, while smaller fish can actually be passed through the plants without harm. The main effect on other forms of marine life is a dominance of warm tolerant forms in the immediate area of the discharge. Monitoring of water quality around thermal stations does not indicate changes in dissolved oxygen levels or other important parameters. Reasonable predictions of the impact of a thermal power plant on the marine environment can be made by combining ecological studies with a prediction of the thermal regime at that site. Water temperature criteria should be flexible, and each power plant should be examined as a special case. (Novotny-Vanderbilt)
W71-07325

THERMAL POWER, AQUATIC LIFE, AND KILOWATTS ON THE PACIFIC COAST,
Pacific Gas and Electric Company, Emeryville, California.
James R. Adams.
Proceedings of the American Power Conference, Vol 31, 1969.

Descriptors: *Aquatic life, *Thermal pollution, California, Fish, Temperature, Estuaries, Ecology, Marine fish, Water quality, Thermal powerplants, Salmon, Isotherms, Mapping, Aquatic habitats, Coasts, Dissolved oxygen, Pacific Coast Region, Water pollution effects.
Identifiers: Temperature effects.

The paper summarizes some representative studies carried out at thermal power stations in both estuaries and open ocean environments of California. The studies were performed on the thermal tolerance of selected aquatic organisms (fish, oysters). The hazards to a small fish from a trip through the cooling water system were compared to hazards from intake screen impingement by flume temperature experiments and by actual passage through an operating condenser. Salmon passed through the condenser and had no fatalities in 10 separate tests. The use of surface isotherm maps is also discussed. It was also concluded that the temperature increase imposed by the passage of cooling water through operating thermal stations in tidewater does not cause a change in the DO content of the water. Natural temperature fluctuations considerably exceeded the heat loadings imposed by the thermal powerplants. (Novotny-Vanderbilt)
W71-07326

MERCURY IN THE MARINE ENVIRONMENT,
Scripps Institute of Oceanography, La Jolla, Calif.
David H. Klein, and Edward D. Goldberg.
Environmental Science and Technology, Vol 4, No 9, p 765-767, Sept 1970.

Descriptors: *Heavy metals, Water pollution, *Sea water, Metals, Industrial wastes, Marine fish, Marine bacteria, Marine plants, Oceans, Sediments, Organic compounds, Biochemistry, Path of pollutants, Marine animals, Water pollution effects.
Identifiers: Mercury, *Mercury pollution.

Mercury levels in coastal marine organisms are several orders of magnitude greater than in comparable volumes of sea water. Also, higher values of mercury are found in sediments near sewer outfalls as compared to similar deposits further removed from the outfalls. High mercury content in sediments on the east Pacific Ridge may be explained by high organic productivity rather than on the basis of vulcanism or hydrothermal activity. The effects of sewer outfalls on the mercury content of marine sediments were investigated. Near the outfall, the mercury content of the sediments is as much as fiftyfold higher than presumably uncontaminated sediments further away. Industrial and agricultural dispersion of mercury compounds involves organisms by their ingestion of both compounds of this element, and of the element itself. (Novotny-Vanderbilt)
W71-07328

PARAMETRIC STUDY OF POWER PLANT THERMAL POLLUTION,
Newark Coll. of Engineering, N.J.
Amir Nahavandi, and John Campisi.
Journal Water Pollution Control Federation, Vo 43, No 3, p 506-514, Mar 1971.

Descriptors: *Powerplants, *Thermal pollution *Temperature, *Condenser, Stream, Mathematica models, Water pollution effects, Computer pro grams.
Identifiers: Parametric study, Power capability fac tor, Recirculation factor.

The power capability and thermal pollution effec of stream power plants located on rivers or stream were analyzed to determine the power capabilit for a given downstream temperature. The equa tions for condenser cooling water were derived an nondimensionalized and a minimum number o dimensionless parameters introduced. By means o a digital computer program, charts were develope that show that power capability and thermal pollu tion factors (ratio of downstream temperature t condenser temperature, both referred to a mospheric) are direct and inverse linear function respectively, of upstream temperature factor (rati of upstream and condenser discharge temper tures, both referred to atmospheric). Increase dilution factor improves power capability facto and increases thermal pollution factor; increase recirculation factor adversely affects power capa bility factor and decreases thermal pollution facto (Oleszkiewicz-Vanderbilt)
W71-07329

A COMPUTER BASED FLORISTIC ANALYSI OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. Biology.
For primary bibliographic entry see Field 02L.
W71-07337

MERCURY POLLUTION OF SEA AND FRES WATER--ITS ACCUMULATION INTO WATE BIOMASS,
Tokyo Univ. (Japan). Dept. of Urban and Sanita Engineering; and Kobe Univ. (Japan). Dept Public Health.
Jun Ui, and Shoji Kitamura.
Contribution to the 4th Colloquium for Medic Oceanography, Oct 2-5, 1969, Naples, Italy. 33 11 fig, 4 tab, 52 ref.

Descriptors: *Public health, *Water pollution e fects, *Heavy metals, Water pollution source Water pollution control, Mortality, Safety, Chem cal wastes, Biomass.
Identifiers: *Mercury pollution, *Methyl mercu *Minamata disease, Japan, Italy, Holland, Swede

The methyl mercury pollution problems in Japa Sweden and Italy are discussed. Mercury pollutio in Japan is tied to Minamata disease, a severe into ication of the central nervous system of m caused by ingestion of fish and shellfish contain methyl mercury. The discovery of mercury pol

on in fish and other food in Sweden and its effect n public health and on the environment are iscussed. Sources of mercury pollution are listed. preliminary investigation of mercury pollution is eported from chemical industries in Italy. They bserved elevated mercury concentrations in fish ear chemical plant waste discharge areas. A case f mercury pollution in Holland is discussed. The eed and the present technological ability to stop ie discharge of mercury compounds into the en- ironment is stressed. (Sjolseth-Washington)
71-07338

OME PROBLEMS IN THE TESTING OF IATERIALS WITH ALGAE,
entral Lab. TNO, Delft (Netherlands).
. J. Hueck, and D. M. M. Adema.
ummaries in German, English, French and panish. Material und Organismen, Vol 2, No 2, p 41-152, 1967. 1 fig, 4 tab, 15 ref.

escriptors: *Algicides, *Paints, *Test procedures, ntifouling materials, Testing, Biodegradation, Al- ie, Marine algae, Growth rates, Analytical chniques, Laboratory equipment, Asbestos ce- ent, Chlorella, Carbon dioxide.
entifiers: *Test development, *Test problems, ormidium sp.

few considerations are given about the testing of gicides incorporated in paints and stony materi- s. Two experimental designs are described: one r testing algicidal paints with aquatic algae, and ie for testing algicidal asbestos-cement with aerial gae. For the first purpose a static test is undesira- e because of the building up of toxic concentra- ns in the medium whereas the actual toxicity at e surface of the material should be measured. A evice is proposed that uses a continuously innocu- ted medium flowing slowly through a test aquari- n. For the testing of asbestos-cement and other kaline stony materials with aerial algae it is found at the availability of CO2 near the surface may be limiting factor. Another device is described to st samples in a flow of air enriched with 5% CO2. jolseth-Washington)
71-07339

ETHAL EFFECTS OF THE INSECTICIDE DVP ON THE EGGS AND HATCHLINGS OF HE SNAKE-HEAD, CHANNA PUNCTATUS L.) (OPHIOCEPHLIFORMES: PHIOCEPHALIDAE),
lyani Agricultural Univ. (India). Dept. of Zoolo- .
shil Kanta Konar.
panese Journal of Ichthyology, Vol 15, No 3, p 0-133, 1969. 1 fig, 1 tab, 15 ref.

escriptors: *Bioassay, *Viability, *Resistance, ethal limit, Toxicity, Mortality, Or- nophosphorous pesticides, Fish eggs, Hatching, hibition, Fish physiology, Juvenile fishes.
entifiers: *DDVP, *Channa punctatus, latching time, *Hatching success, Hatchlings, edian survival time, Susceptibility.

aboratory bioassays were made at 66-75 F to termine the effects of the organophosphorous sticide DDVP on the viability of the snake-head awn and hatchlings. Sixteen different concentra- ns ranging from 0.10 to 20.0 ppm were tested ainst duplicate samples of eggs placed in cylindri- glass jars holding 8 litres of unchlorinated ter. The eggs hatched at all test concentrations. tching time increased with increased concentra- n. All eggs hatched at concentrations up to 1.0 m within 12 hr. Within the same period, about % of the eggs hatched at 1.6 to 16 ppm, and 55% tched at 20 ppm; the remaining eggs hatched thin 24 hr. Yolk sac absorption was normal at 0 ppm. The yolk absorption gradually decreased 1.6 to 4.0 ppm, and totally stopped at 5.0 ppm ater. The hatchlings were many times more sen- ive to DDVP than the eggs. The median survival te of hatchlings gradually decreased with the in- ease of concentration. The eggs and hatchlings survived well at 0.10 ppm DDVP. (Sjolseth-Washington)
W71-07340

NICOTINE AS A FISH POISON,
Kalyani Agricultural Univ. (India). Dept. of Zoology.
S. K. Konar.
The Progressive Fish Culturist, Vol 32, No 2, p 103-104, Apr, 1970. 1 tab.

Descriptors: *Chemcontrol, *Fish control agents, *Carp, *Toxins, Aquatic insects, Fish management, Poisons, Toxicity, Pest control, Pesticides, Pesticide toxicity, Bioassay, Laboratory tests, Fish food organisms.
Identifiers: *Nicotine, *Labeo rohita, *Puntius sophore, *Ranatra filiformis, *Dytiscus sp., Sodium cyanide.

A pesticide that permits rapid and inexpensive live-capture of fish is described. The water soluble plant alkaloid nicotine (1-methyl-2- (3-pyridyl) pyrrolidine) offers some interesting possibilities for this purpose. Quick surfacing and rapid total recovery of the fish removed from the test concentrations were encountered. Recovery time was 2-4 minutes. The aquatic insects tested did not surface at any of the concentrations tested, and were apparently unaffected by the concentrations required to live-capture fish. (Wahtola-Washington)
W71-07341

A NITROGEN GAS DISEASE CATASTROPHE,
Oregon Fish Commission, Clackamas; and Bureau of Commercial Fisheries, Astoria, Oreg.
Ellis J. Wyatt, and Kirk T. Beiningen.
Proceedings of the 20th Annual Northwest Fish Culture Conference, Dec 3-4, 1969, Washington Dept of Game, Olympia, p 71-72.

Descriptors: *Nitrogen, *Fishkill, *Fish passages, *Fish diseases, Pathology, Mortality, Salmon, Gases, Fish handling facilities, Fish hatcheries, Fish management, Fish physiology, Fish toxins, Fish conservation, Water pollution effects, Water pressure, Bioassay, Rainbow trout.
Identifiers: *Chinook salmon, *Gas embolism, *Gas bubble disease.

A severe fish loss is described at the Fish Commission of Oregon's South Santiam Fish Hatchery. Approximately 75-95% of the stock died of gas embolism. Attempts were made to recreate the conditions. Nitrogen gas concentrations were approximated at 175% saturation. Fish died 2 min after first showing signs of abnormal behavior. An LT (100%) (N — 476 fish) occurred at 295 minutes. (Wahtola-Washington)
W71-07342

CATFISH CULTURE IN EFFLUENT WATER,
State Coll. of Arkansas, Conway.
Richard A. Collins.
The Catfish Farmer, Vol 2, No 3, p 7-11, 1970. 7 fig, 1 tab.

Descriptors: *Channel catfish, *Fish farming, *Thermal pollution, *Temperature, Growth rates, On-site investigations, Spawning, Aquiculture, Fish stocking, Catfishes, Thermal water, Texas, Mississippi, Cooling water, Beneficial uses, Mississippi, Texas.
Identifiers: *Cage culture, Feeding cages, Quinaldine.

Channel catfish were cage-reared in Lake Hico, Mississippi and in Lake Colorado City, Texas, which were used as cooling reservoirs by utility companies. Catfish can be reared in the winter in thermal effluents with the same degree of success associated with other lakes in the warmer months. (Wahtola-Washington)
W71-07343

AN INVESTIGATION OF ELEPHANT SEAL AND SEA LION MORTALITY ON SAN MIGUEL ISLAND,
Naval Undersea Research and Development Center, Point Mugu, Calif. Marine Bioscience Facility.
J. G. Simpson, and W. G. Gilmartin.
Bio-science, Vol 20, No 5, p 289, Mar 1, 1970. 2 ref.

Descriptors: *Mortality, *Oily water, *Oil, *Mammals, *Water pollution effects, Toxicity, DDT, Industrial wastes, Ecology, Aquatic animals, Resistance, Pathology, Viruses, Water pollution, On-site investigations, California, On-site data collections, Chromatography, Spectrophotometry.
Identifiers: *Seals, *Sea lions, *Santa Barbara oil spill, *Oil pollution, *Mirounga sp., *Zalophus sp., Crude oil, DDE, Hydrocarbon residues.

Reports of sea lion and elephant seal mortalities caused by the Santa Barbara oil spill were investigated. Several elephant seals with oil on their skin were found, but few appeared ill or distressed. One exception responded well to antibiotics. Autopsy of dead seals and chromatographic and infrared spectrographic tissue analyses failed to indicate hydrocarbon, DDT or DDE residues. Similar tests were made with newly aborted sea lion pups and with one adult sea lion, again with negative results. Serological, histological, bacteriological and virological tests were negative. No correlation existed between the oil spill and the reported mortalities of elephant seals and of sea lions. Supporting references are cited. (LeGore-Washington)
W71-07344

CONTAMINATION OF THE FRESHWATER ECOSYSTEM BY PESTICIDES,
Bureau of Sport Fisheries and Wildlife, Denver, Colo. Fish-Pesticide Research Lab.
Oliver B. Cope.
Summaries in English, French and German. Journal of Applied Ecology, Vol 3 (supplement), p 33-44, Jun 1966. 3 tab, 4 ref.

Descriptors: *Biological communities, *Pesticide residues, *Pesticide removal, *Pesticide drift, *Pesticide kinetics, *Pesticides, *Pesticide toxicity, Ecosystems, Food chains, Water pollution effects, DDT, Chlorinated hydrocarbon pesticides, Fish behavior, 2-4-D, Fish reproduction, Fishkill, Resistance, Growth rates, Fish genetics, Aquatic environment.
Identifiers: *Freshwater ecosystems, *Pesticide pollution, Contamination, Pathologic effects.

The contamination of freshwater ecosystems by pesticides and the subsequent fates of the pesticides are described. The acute effects of pesticides on the flora and fauna are examined, and subacute effects, such as those on behavior, growth, mortality, reproduction, pathology and resistance and genetics, are reviewed. The infinite variety of environmental features of lakes and streams, the multiplicity of chemicals and formulations seen among modern pesticides, and the kinds of effects already noted and measured when pesticides meet plants and animals in freshwater are discussed to emphasize the fact that interactions among these factors can be highly dynamic, productive of manifold effects, and most difficult to predict. (Sjolseth-Washington)
W71-07345

TOXICITY OF ORALLY AND TOPICALLY APPLIED PESTICIDE INGREDIENTS TO CARP, CYPRINUS CARPIO LINNE,
Agricultural Chemicals Inspection Station, Tokyo (Japan); and Institute of Physical and Chemical Research, Tokyo (Japan).
Yasushi Hashimoto, and Jun-ichi Fukami.
Bochu-Kagaku ('Scientific Pest Control'), Vol 34, No 2, p 63-66, 1969. 1 tab, 7 ref.

Descriptors: *Pesticide toxicity, *Mode of action, *Application methods, Pesticides, Carp,

Methodology, Test procedures, Lethal limit, Bioassay, DDT, Chlorinated hydrocarbon pesticides, Organophosphorous pesticides, Herbicides, Fungicides.
Identifiers: *Cyprinus carpio, *Oral application, *Tropical application, Fish gills.

Oral and topical applications of various insecticides, fungicides and herbicides were made on Cyprinus carpio. The LD-50 values for these methods were compared and they were found to differ. In general, the oral application method exhibited lower toxicity than the contact method, expecially with fungicides and herbicides. The site of action of various pesticides in fish was discussed based on the listed LD-50 values. Gill parts are thought to be an important site of action or pathway entrance for some pesticides. Further studies are needed to elucidate the modes of action of pesticides on fish. (Sjolseth-Washington)
W71-07346

SHARK PIT ORGANS: RESPONSE TO CHEMICALS,
Hawaii Univ., Honolulu.
Yasuji Katsuki, Keiji Yanagisawa, Albert L. Tester, and James I. Kendall.
Science, Vol 163, p 405-407, 24 Jan 1969. 2 fig, 6 ref.

Descriptors: *Fish physiology, *Fish behavior, *Sodium chloride, *Ions, Sharks, Calcium, Magnesium, Inhibition, Acids, Ammonium salts, Cesium, Discharge measurement.
Identifiers: *Shark pit organ, *Electrophysiology, *Chemical stimulation, *Mechanical stimulation, Nerve fibers, Canal neuromasts, Response, Nurse sharks, Sugar, Quinine, Potassium, Lithium, Histology.

Nerve fibers from pit organs and canal neuromasts are distinguished by the nature of their electrophysiological response to mechanical and chemical stimulation. Pit organs respond to touch but have a relatively high threshold compared with canal neuromasts. They respond readily to sodium and potassium chloride solutions, the rate of discharge increasing with the concentration of the solution. Order of effectiveness with one molar solutions on monovalent cations is as follows: potassium, rubidium greater than sodium, ammonium greater than cesium, lithium. Anions are ineffective. Divalent cations such as calcium and magnesium are inhibitory. Responses to acid, sugar and quinine are either very slight or inhibitory. (Sjolseth-Washington)
W71-07347

GHOST SHRIMP CONTROL EXPERIMENTS WITH SEVIN, 1960-1968,
Washington State Dept. of Fisheries.
R. E. Westley, Herb Tegelberg, Doug Magoon, Clyde S. Sayce, and John S. Chambers.
Washington State Dept of Fisheries Technical Report No 1, Jan 1970. 61 p, 11 fig, 17 tab, 15 ref.

Descriptors: *Commercial shellfish, *Legal aspects, *Pest control, *Chemcontrol, *Carbamate pesticides, Washington, Shrimp, Oysters, Pesticide toxicity, Pesticide residues, Pesticide removal, Regulation, Tidal waters, Mortality, Persistence, Geologic control, Sediment control.
Identifiers: *Sevin, *Ghost shrimp, *Upogebia sp., *Callianassa sp., Grays Harbor Washington.

The report is a compilation of four papers: Sevin (1-napthyl N-methyl carbamate) treatment of a subtidal oyster bed in Grays Harbor, Washington; the uptake of Sevin by Pacific Oysters and bottom muds; observations on potential uptake of Seven by Pacific Oysters; and, investigation of chemical control of ghost shrimp on oyster grounds 1960-1963. With a 10 lb/acre application of Sevin, its uptake by oysters was low and dropped to background levels within four days of application. Sevin residues in bottom mud disappeared by the 16th day. Sevin in concentrations of 10 lb/acre is an effective agent for controlling ghost shrimp. Based on these reports, the Washington State Department of Fisheries promulgated a regulation to maintain strict control of the use of pesticides on oyster grounds. Under a set of restrictions, Sevin is authorized for use in controlling ghost shrimp. (Sjolseth-Washington)
W71-07348

ISOTOPE BIOLOGY OF C-13. EXTENSIVE INCORPORATION OF HIGHLY ENRICHED C-13 IN THE ALGA CHLORELLA VULGARIS,
Argonne National Lab., Ill. Chemistry Div.
E. Flaumenhaft, R. A. Uphaus, and J. J. Katz.
Biochimica et Biophysica Acta, Vol 215, p 421-429, 1970. 3 fig, 1 tab, 26 ref.

Descriptors: *Cytological studies, *Chlorella, *Radioactive isotopes, *Stable isotopes, Plant morphology, Amino acids, Cultures.
Identifiers: Ribonucleic acid, Chlorella vulgaris.

Previously performed work revealed that a replacement in Chlorella vulgaris of ordinary isotopes of hydrogen, carbon, nitrogen, and oxygen by the heavy, stable H-2, C-13, N-15, and O-18 resulted in drastic cytochemical and morphological changes. In this study, C vulgaris has been grown on C-13 (95% C-13) in H-1 and H-2 media. The cytochemical investigations included cell size distribution, carbohydrates, nucleic and amino acids, and proteins. The abnormalities detected in C-12 - H-2 algae diminished in C-13 - H-2 cultures, indicating that a replacement of isotopes in living organisms may radically modify the simple additive relationship. A clear change in cytoplasmic RNA, expressed in cells thread-like accretions, was observed in C-13 - H-2 and in C-13 - H-1 cultures. (Wilde-Wisconsin)
W71-07351

EFFECTS OF ROTENONE ON ZOOPLANKTON COMMUNITIES AND A STUDY OF THEIR RECOVERY PATTERNS IN TWO MOUNTAIN LAKES IN ALBERTA,
Calgary Univ (Alberta). Canadian Wildlife Service.
R. Stewart Anderson.
Journal Fisheries Research Board of Canada, Vol 27, No 8, 1335-1356, 1970. 7 fig, 4 tab, 50 ref.

Descriptors: *Insecticides, *Rotenone, *Toxicity, *Zooplankton, *Water pollution effects, Biological communities, Fish, Lakes, Mortality, Crustaceans, Succession, Phytoplankton, Rotifers, Resistance, Environmental effects, Diatoms, Larvae, Copepods, Snails.
Identifiers: *Recovery patterns, Side effects, Cladocerans, Jasper National Park (Canada), Community stability, Daphnia galeata mendotae, Gammarus lacustris, Cyclops vernalis, Kellicottia longispina, Keratella cochlearis, Leeches.

Investigation of long-term effects of rotenone on zooplankton communities was undertaken in conjunction with a fisheries management project using rotenone to eradicate undesirable fish. Devastation and recovery of zooplankton communities were studied in relation to application of rotenone to two mountain lakes in Jasper National Park (Canada). Crustacean plankters were absent for about six months after treatment, but rotifers and net phytoplankton were never completely eradicated. All crustacean species, with one exception, reached prerotenone abundance in about three years, probably the minimum time for recovery in these lakes. Recovery is likely related to fecundity, time of reproduction, and the presence of resistant stages. Diaptomus sicilis had not reached reproductive maturity when rotenone was applied, and was the last species to recover to its original numbers. Some species not found in samples before application were found in small numbers afterwards, probably partly due to movement from littoral into limnetic zone. Blooms of small cladocerans after treatment were soon supplanted by increases in large cladoceran numbers. Most variations in composition and abundance after rotenone were likely due to changes in competition and predation pressures rather than to changes in environmental factors or direct effects of rotenone. (Jones-Wisconsin)
W71-07353

A COMPARATIVE STUDY OF CELL THERMOSTABILITY OF MOLLUSKS FROM THE WHITE SEA IN RELATION TO THE VERTICAL DISTRIBUTION OF SPECIES AND THE HISTORY OF FAUNA DEVELOPMENT, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Laboratoriya Fiziolozicheskoi Zkolozii.
A. V. Zhirmunskii.
Zhurnal Obshchei Biologii, Vol 30, No 6, p 686-703, 1969. 3 fig, 2 tab, 104 ref.

Descriptors: *Mollusks, *Cytological studies, *Temperature, Biological membranes, Resistance, Ecological distribution, Reproduction, Genetics, Spawning animals.
Identifiers: *Thermostability, *White Sea, *Vertical distribution, Kandalaksha Bay, Boreal species, Arctic species.

This study was concerned with thermostability of oscillating epithelial cells of 12 mollusk species inhabiting the White Sea. A correlation was established between the level of thermostability, vertical distribution of the species, the critical limits of temperature, and the average temperature of spawning. The physiology of organisms reflects the properties acquired by their ancestors in the original habitats. The cell thermostability of arctic species is considerably lower than that of boreal species. (Wilde-Wisconsin)
W71-07355

ON METHANE OXIDIZING BACTERIA IN FRESH WATERS. I. INTRODUCTION TO THE PROBLEM AND INVESTIGATIONS ON THE PRESENCE OF OBLIGATE METHANE OXIDIZERS,
Max-Planck-Institut fuer Limnologiezu Ploen (West Germany).
M. Naguib, and J. Overbeck.
Zeitschrift fur Allegemeine Mikrobiologie, Vol 11, No 1, p 17-36, 1970. 19 fig, 2 tab, 52 ref.

Descriptors: *Methane bacteria, *Methane, *Bacteria, *Absorption, Anaerobic bacteria, Oxygen, Carbon, Eutrophication, Lakes, Test procedures, Gas chromatography, Oxidation.
Identifiers: *Obligate methane oxidizers, Heterotrophs, Prototrophs, Pink organisms, Methane oxidation, Lake Pluss (West Germany).

Bacterial cultures of presumably methane-oxidizers were obtained from water samples collected from different layers of eutrophic Pluss Lake in Schleswig-Holstein (West Germany). The dynamics of gases was investigated by gas chromatographic analyses. Pure culture of the dominant forms were isolated by means of a micro-manipulator. Incubation of isolated bacteria with methane as the only source of carbon failed to demonstrate the uptake of methane; the organisms proved to be heterotrophs subsiding on conventional organic substrata. No obligate methane oxidizers, such as Pseudomonas methanica, Methylococcus, and Methanomonas methanooxidans, were present in the investigated lake. The authors disagree with claims of prototrophic growth of bacteria with methane as the only source of energy. (Wilde-Wisconsin)
W71-07356

THE GROWTH RATE VARIABILITY OF CHLORELLA VULGARIS BEIJER. CLONE GROWTH AFTER MUTAGEN TREATMENT UNDER AUTOTROPHIC OR HETEROTROPHIC CONDITIONS ON THE SURFACE OF A SOLID MEDIUM,
Ceskoslovenska Akademie Ved, Trebon. Lab. for Algology.
J. Necas.

iologia Plantarum (Praha), Vol 12, No 5, p 359-67, 1970. 6 fig, 9 ref.

escriptors: *Chlorella, *Cytological studies, Light, *Growth rates, Populations, Ultraviolet adiation.
lentifiers: Chemical mutagens, Chlorella vulgaris, lones.

he cells of mutation-predisposed Chlorella vularis, strain Cesnokov 'V' clones, were treated with hemical mutagens: N-ethyl-N-nitrosourea and ydroxylamine hydrochloride. The cells were then ansferred to solid media of different nutrient conents and the rate of growth recorded at 28-30C. he investigated Cesnokov's strain exhibited suerior variability, particularly on media free from efficiencies. Changes of light conditions for the urpose of inducing reparation of the mutagen amaged cells failed to influence clonal populaons. (Wilde-Wisconsin)
71-07357

HOTOSYNTHETIC COEFFICIENT AS A UNCTION OF THE COMPOSITION OF LANT BIOMASS, (IN RUSSIAN),
stitut Mediko-Biologicheskikh Problem, Moscow USSR).
. V. Begrov.
nglish summary. Zhurnal Obshchei Biologii, Vol , No 1, p 99-105, 1970. 9 ref.

escriptors: *Photosynthesis, *Numerical analysis, Plants, Analytical techniques, Mathematical odels, Metabolism, Biomass, Chlorella.
entifiers: *Formulae, *Photosynthetic coefficnt, Potato, Chlorella pyrenoidosa.

ormulae are included for calculation of the notosynthetic coefficient of plants. The components of sums and their ratios include elemental d biochemical properties of plant tissues, such as omass, content of assimilated carbon dioxide, ater consumption per unit of dry matter, emanaon of oxygen, content of nutrient elements, etc. n example illustrates variation of the notosynthetic coefficient under the influence of similated nitrogen. The coefficients are calcuted for potato and Chlorella pyrenoidosa. A relaonship was established between the current, ingral, and average values of the coefficient. Vilde-Wisconsin)
71-07359

OTES ON FRESHWATER ALGAE, (IN GERAN),
enna Univ, (Austria), Botanisches Institut und otanischer Garten.
othar Geitler.
sterreichische Botanische Zeitschrift, No 118, p 6-310, 1970. 16 ref.

escriptors: *Algae, *Fresh water, Distribution tterns, Behavior.
entifiers: Mougeotia genuflexa, Ankistrodesmus catus, Podohedra.

is paper describes distribution and behavior of eshwater algae, including Mougeotia genuflexa, nkistrodesmus falcatus, var stipitatus, and mems of the genus Podohedra. (Wilde-Wisconsin)
71-07360

IOTO-FILM INDUSTRY WASTES: POLLUON EFFECTS AND ABATEMENT,
ntral Public Health Engineering Research Inst., gpur (India).
r primary bibliographic entry see Field 05D.
71-07366

FFECTS OF ALKYLBENZENE SULFONATES N YEASTS,
orgia State Univ., Atlanta. Center for Disease ntrol.
r primary bibliographic entry see Field 05A.
71-07387

EFFECTS OF VARIOUS METALS ON BEHAVIOR OF CONDITIONED GOLDFISH,
California Univ., San Francisco.
For primary bibliographic entry see Field 05A.
W71-07398

CHROMOSOME BREAKAGE IN HUMANS EXPOSED TO METHYL MERCURY THROUGH FISH CONSUMPTION,
National Inst. of Public Health, Stockholm (Sweden).
Staffan Skerfving, Kerstin Hansson, and Jan Lindsten.
Archives Environmental Health, Vol 21, p 133-139, Aug 1970. 2 fig, 2 tab, 37 ref.

Descriptors: *Water pollution effects, *Chromosomes, Pollutents, Toxins, Animal physiology, Heavy metals, Fish, Toxicity.
Identifiers: *Mercury, Lymphocyte, Chromosome breaks, Phenyl mercury, Methoxyethyl mercury, Alkyl mercury compounds.

Several alkyl mercury compounds, phenyl mercury, and methoxyethyl mercury have been shown to induce chromosome abnormalities in different organisms. Preliminary study shows an increased frequency of chromosome breaks in cells from lymphocyte cultures from nine subjects known to have increased blood levels of mercury. The subjects had eaten contaminated fish at least three times a week for more than five years. Mercury levels in these fish ranged from 1 to 7 p.p.m. Three subjects had not consumed contaminated fish for 5 to 18 months; the others were still exposed. Four healthy subjects were studied as controls. Mercury level in red blood cells was measured for all subjects. The exposed subjects had levels about 2 to 40 times higher than unexposed subjects. There was no statistically significant difference in the frequency of chromosome breaks between the control and the exposed group. However, there was a significant correlation between the frequency of cells with breaks and mercury concentration. The biological significance of these findings is not known. (Mortland-Battelle)
W71-07410

A POLYCHLORINATED BIPHENYL (AROCLOR 1254) IN THE WATER, SEDIMENT, AND BIOTA OF ESCAMBIA BAY, FLORIDA,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
T. W. Duke, J. I. Lowe, and A. J. Wilson, Jr.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 2, p 171-180, Mar-Apr 1970. 2 fig, 3 tab, 7 ref.

Descriptors: *Water pollution effects, *Bioassay, *Toxicity, *Chlorinated hydrocarbons, *Bioindicators, Industrial wastes, Florida, Sessile algae, Estuaries, Chemical wastes, Gas chromatography, Sediments, Oysters, Shrimp, Crabs, Water pollution sources, Sea water, Trout, Toxins.
Identifiers: *Polychlorinated biphenyls, Aroclor 1254, Escambia River, Pinfish, Flounder, Croaker, Menhaden.

Aroclor 1254, a polychlorinated biphenyl, has been detected in the biota, sediment, and water of estuarine areas near Pensacola, Florida. Only one source of the chemical, an industrial plant on the Escambia River, has been found. Water, sediment, and fish, crab, oyster, and shrimp samples were collected from April through October 1969 and analyzed using gas chromatography procedures. In addition, bioassays on fish, shrimp, and oysters were conducted under controlled laboratory conditions to determine the toxic effects of Aroclor 1254. These studies showed that juvenile shrimp were the most sensitive and were killed when exposed to 5.0 ppb of Aroclor 1254 in flowing sea water. The Aroclor content in water from Escambia Bay, even near the mouth of the river, was less than 1 ppb. Shrimp collected from the bay contained a maximum of 2.5 p.p.m. Thus, shrimp in the bay probably were not exposed to lethal levels during the sampling period. Highest concentrations in the water occurred during August and decreased when leakage from the plant was corrected. (Mortland-Battelle)
W71-07412

POLYCHLORINATED BIPHENYL: INTERACTION WITH DUCK HEPATITUS VIRUS,
Wisconsin Univ., Madison. Dept. of Veterinary Science.
Milton Friend, and Daniel O. Trainer.
Science, Vol 170, No 3964, p 1314-1316, Dec 18, 1970. 1 fig, 2 tab, 8 ref.

Descriptors: *Mallard duck, DDT, Mortality, Viruses, Toxicity.
Identifiers: *Polychlorinated biphenyl, *Hepatitis virus, Aroclor 1254.

As part of an investigation of possible interactions between organochlorine pollutants and infectious diseases, this study was initiated to determine whether any interaction, antagonistic or synergistic, occurs with PCB and duck hepatitis virus (DHV) in mallards. Ten-day-old mallard ducklings fed a polychlorinated biphenyl at concentrations of 25, 50, and 100 parts per million for 10 days suffered no apparent clinical intoxication. Five days later these birds were challenged with duck hepatitis virus, and they suffered significantly higher mortality than birds which were not exposed to the polychlorinated biphenyl. The study illustrates one of the potential effects of sublethal concentrations of chemical pollutants. (McCann-Battelle)
W71-07413

HETEROTROPHIC NUTRITION OF THE MARINE PENNATE DIATOM, CYLINDROTHECA FUSIFORMIS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W71-07415

A COMPREHENSIVE APPRAISAL OF THE EFFECTS OF COOLING WATER DISCHARGE ON AQUATIC ECOSYSTEMS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 05B.
W71-07417

THERMAL DISCHARGE FROM NUCLEAR PLANTS AND RELATED WEATHER MODIFICATION,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
Ronald Stewart.
Proceedings of Twelfth Conference on Great Lakes Research, University of Michigan, p 488-491, May 5-7. 2 tab, 6 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, Temperature, Humidity, Fog, *Weather modification, *Benificial use, Water pollution effects.
Identifiers: Thermal discharge.

The volume of thermal discharge from power plants is increasing at a rate which suggests that the discharge will cause inadvertent weather modification. A 1000 MW nuclear powerplant uses approximately one million gallons per minute of which 10,000 gallons evaporate. This is sufficient to reduce visibility and increase fogging in the area under suitable atmospheric conditions. Beneficial uses of thermal discharge are suggested and calculations are presented to indicate that waste heat released by a dry closed circuit cooling system is sufficient to dissipate fog and increase visibility. (Upadhyaya-Vanderbilt)
W71-07418

THERMAL INVESTIGATIONS IN CALIFORNIA,
Pacific Gas and Electric Co., Emeryville, Calif.

James R. Adams.
Marine Pollution Bulletin, Vol 1 (NS), No 9, p 140-142, Sept 1970.

Descriptors: *Thermal pollution, *California, *Estuaries, Temperature, Ecology, Thermal powerplants, Mapping, Isotherms, Fish, Aquatic life, Water quality, Aquatic habitats, Pacific Coast Region, Tidal powerplants, Water pollution effects.
Identifiers: *Thermal tolerance.

In California 22 power stations with a total capacity of 16,824 MW discharge into tidal areas. Research into thermal tolerance of fish and other aquatic organisms to cooling water was conducted in order to provide necessary information for evaluation of ecological impact. The investigations made in several locations (San Francisco Bay Delta, Monterey Bay) are described and a summary of results discussed. The prediction of ecological impact for one location (Diablo Nuclear Plant), was verified and it was found that the marine community had definitely responded to the discharge but had returned to an essentially normal complement of warm water and cold water forms within 230 m of the discharge. (Novotny-Vanderbilt)
W71-07420

MERCURY: NO NEED FOR HYSTERIA.

Life, Vol 70, No 3, p 32-33, Jan 29, 1971.

Descriptors: *Metals, *Aquatic life, *Food chains, Limiting factors, Water pollution effects.
Identifiers: *Mercury pollution, *Mercury poisoning, Methylmercury, Tuna, Swordfish.

This article is aimed at describing, in broad terms, the mercury pollution problem, its origin, pathways of mercury, potential hazard to human beings and necessary, as well as unnecessary, precautions. Swordfish and tuna may have high amounts of mercury because they are both wide ranging predators, at the top of long food chains. In the body of water containing 0.00001 ppm of mercury, the fish might contain 10 ppm. Symptoms and a brief history of mercury poisoning is given. The Food and Drug Administration limit of 0.5 ppm maximum permissible concentration in food is quoted, however, the Food and Drug Administration cannot state that all mercury residue in fish below this guideline is safe, as well as that all mercury above 0.5 ppm is unsafe. (Oleszkiewicz-Vanderbilt)
W71-07422

IMPACT OF WASTE HEAT ON AQUATIC ECOLOGY,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
Clarence A. Carlson.
Proceedings of the Symposium, 'Our Generation and Environmental Changes', American Association of Advancement Sciences Meeting, 1969. 9 p, 10 ref.

Descriptors: *Temperature effects, *Thermal pollution, *Ecology, *Thermal powerplants, Cooling water, *Aquatic population, Temperature, Streams, Water pollution effects.

The impact of increasing electric power production connected with increasing discharges of waste heat in streams from the standpoint of ecology and water quality represents a serious problem. The temperature is important to aquatic organisms as a lethal, directive, and controlling factor. Five major effects of heat pollution on higher aquatic organisms are listed. The importance of water quality and temperature standards are listed. The importance of water quality and temperature standards ought to be stressed. In addition to standards, there is a great need for more research on the response of various aquatic organisms to temperature. Several possible means to control water temperature (cooling tower, etc.) are discussed. (Novotny-Vanderbilt)
W71-07424

ECOLOGICAL IMPACT OF NUCLEAR-FUELED POWER PLANTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
Clarence A. Carlson.
In: Extension Series, Cornell University, Ithaca, New York, Department of Natural Resources, (1970). 33 ref.

Descriptors: *Temperature effects, *Thermal pollution, Ecology, *Nuclear powerplants, *Cooling water, Radioactive wastes, Fish, Aquatic population, Temperature, Streams, Lakes, Estuaries, Water pollution effects.

Nuclear powerplants require water for cooling their condensers and such plants have a capacity to discharge water that is warmer and more radioactive than the entering water. The discharged heat may be harmful to aquatic organisms. Five major effects of heat pollution are listed in this paper. Proper thermal standards should be developed. The biological effects of radiation are classified as somatic and genetic effects. The radionuclide concentration in aquatic and marine organisms is discussed. The major weakness of radiological standards is that they are designed to protect humans but not to protect aquatic life. Information on responses of aquatic organisms to radiation seems to be inadequate, more research work is necessary. (Novotny-Vanderbilt)
W71-07426

THERMAL POLLUTION-A CAUSE FOR CONCERN,
Virginia Polytechnic Inst., Blacksburg. Coll. of Arts and Sciences.
John Cairns, Jr.
Journal Water Pollution Control Federation, Vol 43, No 1, p 55-66, Jan 1971. 18 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Ecosystems, Electric power industry, Conservation, Thermal stress, Heat, Speciation, Acclimatization, Biota, Water pollution effects.
Identifiers: Thermal tolerance.

The paper is a general discussion of thermal pollution. Its causes, its relationship to the water balance of this nation, and its effects on organisms in lakes, rivers, streams, and estuaries are reviewed. Technological advances cause stresses on the natural environment. Organisms are limited in their responses to changes. Nontolerant species are excluded, and resistent species replace them. Illustrations of the effects of thermal pollution are presented. The concept that this planet's ability to support life and its ability to transform wastes into acceptable or useful materials is discussed. Developing a balanced life-support system that serves the greatest variety of beneficial uses will not be possible unless man abandons narrow discipline-oriented, single-purpose views toward environmental management and use. (OleszKiewicz-Vanderbilt)
W71-07427

THE CANADIAN APPROACH TO ACCEPTABLE DAILY INTAKES OF MERCURY IN FOODS,
Department of National Health and Welfare, Ottawa (Ontario).
A. B. Morrison.
Meeting Paper, Symposium on 'Mercury and Man's Environment', Feb 15 and 16, 1971. Royal Society of Canada, Ottawa.

Descriptors: *Heavy metals, *Human pathology, *Foods, Toxicity, Fish, Environmental engineering, Water pollution effects, Diseases, Epidemiology, Lethal limit, Public health, Animal pathology.
Identifiers: *Mercury, *Mercury pollution, Acceptable daily intakes.

Studies and results on acceptable daily intakes are presented. Acceptable daily intake is obtained by applying a 10-fold safety factor for inter-species variations, and a further 10-fold safety factor for intra-species variations. The acceptable daily intake for man is thus 1/100 of the no-effect level in the most sensitive animal species tested. From the knowledge of the acceptable daily intake, the maximum permissible level (M.P.L.) is obtained. In Canada the limit of 0.5 ppm of mercury in fish on a wet weight basis was adopted and a guideline proposed. The allowable intakes rates are discussed. The lowest whole-blood concentration of mercury associated with toxic symptoms (0.2 mcg/gram) was considered to represent a daily intake of 0.3 mg of methylmercury for 70-kg man. From this computation, it was concluded that the margin of safety in fish contamination as a food for man is very low. But, the program has shown that mercury levels in the total human diet are extremely low. (Novotny-Vanderbilt)
W71-07441

MERCURY IN THE ENVIRONMENT: NATURAL AND HUMAN FACTORS,
Allen L. Hammond.
Science, Vol 171, No 3973, p 788-789, Feb 26, 1971.

Descriptors: *Fish, *Environment, *Toxicity, Standards, Water pollution effects.
Identifiers: *Mercury, Concentration, Health effects.

Metallic mercury and inorganic mercury usually attack the liver and kidney and have a short half-life whereas methyl mercury and other alkyl mercury compounds attack the central nervous system and have a half-life of about 70 days. Symptoms of methyl mercury poisoning in man may include loss of vision, hearing, coordination, and intellectual ability. The lowest concentration in the blood which is reported to cause identifiable symptoms is 0.2 ppm. The oceans contain approximately 1.3 10 to the 18th power metric ton of water with average concentration of mercury close to 0.1 ppb. This amounts to 10 to the 8th power metric tons of mercury whereas total mercury from man's activities amounts to less than 10 to the 4th power metric tons per year. Methylation seems to proceed more efficiently in aerobic systems than in anaerobic systems. (Upadhyaya-Vanderbilt)
W71-07442

AQUATIC ECOSYSTEMS AND THERMAL POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering
Loren D. Jensen, and Derek K. Brady.
Journal of the Power Division, Proceedings of American Society of Civil Engineers, Vol 97, No PO1, Proc Paper 7802, p 209-217, Jan 1971.

Descriptors: *Thermal pollution, *Cooling water, *Thermal powerplants, Water pollution effects, *Sites.
Identifiers: *Aquatic ecosystems, *Thermobiology, Temperature criteria, Biological zones.

The factors which affect biological responses to temperature changes in aquatic ecosystems are discussed in terms of their influence on siting, design and operation of thermal power plants. Recommended are: (1) the development of a basis for classifying aquatic organisms according to their relative importance in maintaining the balance of specific ecosystems, (2) the biological zoning of receiving waters, with time-dependent temperature criteria based on the annual reproduction cycles of ecologically important species; (3) the development of criteria which incorporate the effects of temperature rise, duration of exposure, rate of change, and frequency of violation; (4) the field investigation of planktonic entrainment in cooling water intakes to evaluate the effects of temperature, turbulence and recirculation; (5) a flexible approach to the design of cooling water systems so as to facilitate subsequent modifications and additions, and (6) the incorporation into plant operational procedures of careful control of rates of load change. (Oleszkiewicz-Vanderbilt)
W71-07452

IEXAVALENT CHROMIUM: TOXICOLOGI-'AL EFFECTS AND MEANS FOR REMOVAL ROM AQUEOUS SOLUTION,
Naval Research Lab., Washington, D.C.
'. M Shepherd, and R. L. Jones.
Available from the National Technical Information ervice as AD-717 348, $3.00 in paper copy, $0.95 n microfiche. NRL Report 7215, Jan 4, 1971. 20 , 67 ref.

escriptors: *Chromium, *Water pollution effects. dentifiers: *Chromium compounds, *Toxicity, Chromates, Plants, Botany, Animals, Ecology, Vastes, Industrial, Reviews, Removal, Navy, Ion xchange, *Water treatment, *Chemical removal, Vater treatment, *Water pollution control, Indus-ial waste treatment.

here has been concern recently of the possibility f long-term disturbances of our environmental cology by hexavalent chromium discharged in in-ustrial and, in some cases, naval waste waters. To d in the assessment of these potential dangers, the terature was surveyed to provide a perspective verview of the toxicities of hexavalent chromium oward plant and animal. The means available for educing chromate concentrations in waste waters ppm levels were reviewed for suitability for Navy sage. The techniques considered were chemical duction, with subsequent precipitation of the ivalent chromium product; ion exchange; direct recipitation; ion flotation; electrochemical reduc-on; and electrodialysis. Background and orienta-onal information are furnished for use in con-dering Navy chromate pollution problems and eir rectification.
71-07454

HE EFFECTS OF URBAN DRAINAGE ON AKE McILWAINE, RHODESIA,
McKendrick, and R. K. Williams.
ater Pollution Control, Vol 68, p 523-528, 1969.

escriptors: *Water quality, Water treatment, Ef-ients, Investigations, Water pollution sources. entifiers: *Rhodesia, *Urban runoff, Algal owth, *Lake McIlwaine.

om 1953 to 1959 there was little change in the uality of the water in lake McIlwaine, which is the ain source of supply for Salisbury, Rhodesia, but m 1960 trouble began to be experienced with avy algal growths which interfered with treat-ent of the water. When the lake water intake level s lowered to avoid the algae, problems were used by manganese and iron in the lower waters the lake. Studies on conditions in the lake owed that the algal growths were caused by high ncentrations of phosphate and nitrogen brought o the lake by the rivers to which the effluents m the city's sewage works and oxidation lagoons re discharged; algal growths were most severe ring periods of low rainfall when less dilution was ailable.
71-07524

RINKING OF SULFATE-WATER BY CATTLE,
vada Univ., Reno.
J. Weeth, and J. E. Hunter.
urnal Paper No 168. Journal of Animal Science, l 32, No 2, p 277-281, 1971. 1 tab, 39 ref. West g Research Project W-46.

scriptors: *Sulfates, *Sodium chloride, Farm stes, Cattle, Toxicity, Water, Growth rates, ater pollution effects.
ntifiers: *Drinking water, Sulfate water, moglobin.

is study was designed to characterize some of the ects on cattle of drinking water contaminated h a known concentration of sulfate. Nine-grow-Hereford heifers were offered as drinking water ner tap-water, 5,000 ppm Na sub 2 SO sub 4-ter or 4,110 ppm NaCl-water. The experimental ign was a 3x3 latin square with replicates. Ex-imental periods were 30 days. Total urine was lected on the last 7 days with renal clearance ob-servations being made on the sixth day. The season was summer. The heifers drank less, ate less and lost weight while consuming the sulfate-water. The sulfate ion caused a relative diuresis. Percent urine water of free-water intake was 33.8 with sulfate-water, but only 22.1% with tap water. Total hemoglobin concentration was unaffected by the saline drinking waters, however, the sulfate-water caused a 450% increase in methemoglobin concentration and the development of 416.9 mg/100 ml of sulfhemoglobin. The two nonfunctional hemoglobins comprise 6.2% of total hemoglobin at this time. Drinking the sulfate-water increased serum sulfate concentration 63.1%, increased renal filtration of sulfate 45.2%, but decreased renal reabsorption of sulfate by 27.5%. Drinking sulfate-water did not alter plasma calcium concentration or renal excretion of calcium. A specific toxic effect of drinking the Na sub 2 SO sub 4-water was not apparent, however, the adverse effects seen were related to the sulfate ion. Only a slight polyposia and diuresis were observed with drinking of the NaCl-water. (Christenbury-Iowa State)
W71-07555

WATER CONFLICTS ON LAKE ERIE,
Pennsylvania Dept. of Health, Harrisburg, Pa.
Walter Lyon.
In: Great Lakes Water Resources Conference, Toronto, Hydro-Electric Power Commission of Toronto, p 115-120, 1968.

Descriptors: *Water quality, *Management, *Pollution, *Lake Erie, *Regional analysis, Fisheries, Recreation, Population, Lakes, Streams, Mathematical studies, Costs, Social aspects, Industrial wastes.
Identifiers: *Economic objectives, *Regional economy, *Pollution abatement, Trapped segments, Public policy.

Attempts are made to clarify the facts about the condition of Lake Erie in order to offset the adverse economic effect of reports that Lake Erie is 'dead' and a polluted health hazard. Lake Erie is 'sick' rather than 'dead', having suffered serious injury because many of its uses have been abused by economic objectives which failed to relate the regional economy to the protection of the lake as a natural resource. Some of the lake's problems which are specified include the ecological imbalance of overfertilization by phosphates, the change in the species composition of fish, and the accumulation of residual pollutants from treated sewage and industrial waste discharges. Three steps are proposed to improve the water quality of the lake, namely implementation of the pollution abatement program, improvement of fisheries, and development of a conceptual policy framework based on a model of the lake which considers ecologic, hydrologic, and biochemical and other subsystems operative in the lake and which would relate pollution abatement to resultant water quality and use improvements. (See also W71-07565) (Murphy-Rutgers)
W71-07569

MERCURY IN THE ENVIRONMENT,
Duke Univ., Durham, N.C.; and North Carolina Univ., Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 05B.
W71-07646

THERMAL EFFECTS STUDIES BY NUCLEAR POWER PLANT LICENSEES AND APPLICANTS.
Atomic Energy Commission, New York.

For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $3.50. Hearing before the Joint Committee on Atomic Energy, Congress of the United States, on Environmental Effects of Producing Electric Power, Part 2, Vol 2, p 2233-2315, Jan 27-30, Feb 24-26, 1970.

Descriptors: *Thermal pollution, *Nuclear powerplants, Costs, Condensers, Sites, Temperature, Nuclear reactors, Water pollution effects.
Identifiers: Cooling source, Environmental research.

During 1969, the Atomic Energy Commission Director of Regulation conducted a survey of Atomic Energy Commission nuclear powerplant licensees and studies they had undertaken or planned concerning effects of the discharge of heated condenser cooling water from their plants on aquatic environments. This report consists of brief summaries of the information furnished by 43 respondents. The survey showed that a variety of measures are being taken by many utilities to minimize potential thermal effects of their plants and meet state water quality standards. These methods include cooling towers, cooling ponds, subsurface discharge devices, multiport diffusers, deep water intakes, canals several miles long, and large capacity pumps to increase flow rate during the summer. (Upadhyaya-Vanderbilt)
W71-07665

ENVIRONMENTAL EFFECTS OF CONDENSER WATER DISCHARGE IN SOUTHWEST LAKE MICHIGAN,
BIO-TEST Labs., Inc., Northbrook, Ill.
Lawrence P. Beer.
Proceedings of Twelfth Conference on Great Lakes Research, Michigan University, Ann Arbor, Michigan, p 504-512, May 5-7, 1969. 3 fig, 8 tab, 2 ref.

Descriptors: *Thermal pollution, *Lake Michigan, *Temperature, Dissolved oxygen, Isotherms, *Cooling water, Sport fish, Plankton, Stratification, Water pollution effects, Great Lakes.
Identifiers: Heat dissipation.

A study of heat dissipation rates and patterns, bottom and lake organisms, and chemistry of lake waters was made at the outfall of Commonwealth Edison Company's Waukegan generating station. Heat input from the 760,000 gpm flow with a condenser water rise of 12F, is dissipated 3200 ft. offshore. At only 1500 ft. offshore, heat is dissipated to within 2-3F of ambient. Condenser water mixes with lake water in shallow depths near shore and floats on the surface of deeper cooler water. Dissolved oxygen remained unchanged in the offshore area at near saturation levels of 11.0 to 11.5 mg per liter. Benthic or bottom-living organisms vital to the food chain of commercial and sport fish have not been eliminated by discharge from the station. Plankton counts do not indicate any definite effect from the heated discharge. Sport fish, including trout and coho salmon which frequent the water near the discharge, have not apparently suffered any deleterious effect. The study took place in three days in April. (Upadhyaya-Vanderbilt)
W71-07667

POLLUTION OF LAKE ERIE, LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE ST. LAWRENCE RIVER.
Technical Advisory Board on Air Pollution, International Joint Commission (Canada).

Report by the International Joint Commission Canada and United States, 1970. 174 p, 5 fig, 4 tab.

Descriptors: *Water pollution sources, *Water pollution effects, *Pollutants, *Monitoring, *Legal aspects, Lake Erie, Lake Ontario, St. Lawrence River.
Identifiers: *Potential, Remedial measures, Proposed objectives.

The International Joint Commission reports on an inquiry into the pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River. The locations, causes and extent of pollution were studied. Recommendations for water quality objectives were made in the hopes

that both Canada and the United States would adopt them and enter into agreement on programs and measures to achieve those objectives. Authority by the Commission to monitor the water quality and abatement progress was recommended. The IJC also recommended that the reference of October 1964 be extended to authorize pollution studies in the remaining boundary waters of the Great Lakes and tributary waters. (Ensign-PAI)
W71-07671

A DISSOLVED OXYGEN PRECICTION MODEL FOR A LONG RIVER,
Wisconsin Univ., Madison. Water Resources Center.
Charles H. Falkner.
Technical Report. Preliminary, 1969. 29 p, 12 fig, 21 ref. OWRR Contract C-1228.

Descriptors: *Dissolved oxygen, *River systems, *Biodegradation, Municipal wastes, Industrial wastes, Flow, Temperature.
Identifiers: Deoxygenation, Reoxygenation, Models.

A model was presented for predicting the effects of the deoxygenation-reoxygenation process in a long complex river system resulting from the discharge of biodegradation wastes by municipalities and industries. The model estimated the dissolved oxygen (DO) profile as a function of flow and temperature. The variational effects of flow, temperature and other river parameters were approximated by step functions. The river was divided into subreaches. The approach was essentially a steady state approximation of a dynamic system. The problems and results of applying the model to a 180-mile reach of the Wisconsin River were presented. (Thiuri-Cornell)
W71-07677

INSECTICIDES AND THE GREAT LAKES,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.
Robert E. Reinert.
Limnos Magazine, (Great Lakes Foundation), Vol 2, No 3, p 4-9, 1969. 2 fig.

Descriptors: *DDT, Chlorinated hydrocarbon pesticides, *Pesticide residues, Pesticide toxicity, *Great Lakes, Lake Michigan, *Public health, Gas chromatography, Pesticide removal, *Analytical techniques, Dieldrin, Water pollution effects, Fisheries.
Identifiers: *Coho salmon, Long-term effects, *DDT bodily distribution.

A brief history of the DDT problem in the Great Lakes is presented. The analysis of coho salmon for insecticides is described, as is the DDT distribution in Lake Michigan coho. Abdominal adipose tissue contained 92.33 ppm DDT, belly fat 69.66 ppm, dorsal median fat 62.82 ppm, lateral line fat 34.31 ppm, and flesh 5.66 ppm. The possible implications of the DDT laden fish on human health are discussed. (Sjolseth-Washington)
W71-07690

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.
For primary bibliographic entry see Field 05G.
W71-07697

EXISTING AND POTENTIAL PROBLEMS OF EXCESSIVE EUTROPHICATION IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Chattanooga. Water Quality Branch.
Eugene B. Welch.
Proceedings of the 7th Annual Sanitary and Water Resources Engineering Conference, Vanderbilt University, Nashville, Tennessee, p 45-73, 1968. 7 fig, 8 ref.

Descriptors: *Eutrophication, *Tennessee Valley Authority Project, *Reservoirs, Temperature, Dissolved oxygen, Density, Rooted aquatic plants, Algae, Chlorophyll, Hypolimnion, Phosphorus, Nitrogen, Phytoplankton, Productivity, Turbidity, Surfaces, Depth, Distribution, Time, Epilimnion, Thermocline, Light penetration, Standing crop, Industrial wastes, Rainfall, Alabama.
Identifiers: Cherokee Reservoir (Tenn), Holston River (Tenn), Potomogeton pectinatus, Potomogeton crispus, Heteramthera, Pickwick Reservoir (Tenn), Najas, Photic zone, Douglas Reservoir (Tenn), Norris Reservoir (Tenn), French Broad River (Tenn), Chickamauga Reservoir (Tenn), Florence (Ala).

Pattern of hypolimnetic oxygen depletion in three TVA system reservoirs appears related to phytoplankton productivity, which is affected by several environmental factors. In reservoirs studied, nutrient (nitrogen and phosphorus) content potential limits production only during intense summer stratification. Thermal stratification affecting nutrient distribution and light availability, turbidity affecting light penetration, and water detention time may at various periods and places control production regardless of nutrient content. Field and laboratory evidence shows that growth of two nuisance macrophytes in Tennessee Valley is probably not controlled by nitrogen and phosphorus content of water. Nutrient requirements are apparently less than amounts measured and available. Organic sediment is relatively more important as nutrition sources for maximum growth than surrounding water. Amount of available light at least partly explains annual and seasonal variability in nuisance macrophyte growth. Light reaching stream or lake bottom and available for plant growth during growing season from year to year is affected by interaction of incident light, water depth, and turbidity or relative penetration. These, or related factors, were most favorable during the two years when nuisance macrophyte problems were greatest in Pickwick Reservoir, and were related to plant growth in Holston River during 1967. (Jones-Wisconsin)
W71-07698

5D. Waste Treatment Processes

ACTIVATED SLUDGE TREATMENT OF TEXTILE AND DYEING MILLS WASTE,
M. Kashiwaya.
Proceedings of the 2nd International Conference on Water Pollution Research, Tokyo, Vol 2, p 63-84, 1965.

Descriptors: *Activated sludge, *Sludge treatment, Waste water treatment.
Identifiers: *Dyeing, *Finishing process (General), *Contact-stabilization, *Textile mill wastes, Dyehouse wastes.

In the region of Ichinomiya, Besai, and Kisogawa, Aichi Prefecture, Japan, waste waters from 129 factories processing, dyeing, and finishing textiles have caused serious pollution of the Nikko River and many irrigation channels. After discussing the sources and characteristics of these waste waters, the author reports pilot-scale studies, with tabulated and graphical results, which showed that the waste waters could be treated effectively by either a conventional activated-sludge or a contact-stabilization process. (Livengood-North Carolina State University)
W71-07077

EFFECT OF SURFACE GROUPS ON ADSORPTION OF POLLUTANTS,
Lehigh Univ., Bethlehem, Pa. Dept. of Chemical Engineering.
Robert W. Coughlin.
Copy available from GPO, Sup Doc as SOD order No EP2.10:17020-06/70, $0.40; microfiche from NTIS as PB-198 519, $0.95. Water Pollution Control Research Series, Program No 17020--06/70. 29 p, 14 fig, 1 tab, 13 ref. FWQA Grant No WP-00969-01.

Descriptors: *Activated carbon, *Adsorption, *Organic compounds, Kinetics, Isotherms, Separation techniques, Solvents, Solutes, Oxidation, Mixing, Temperature, Phenols, Tertiary treatment, Waste water treatment, *Oxides.
Identifiers: *Acidic surface oxides, Specific surface area, Graphite, Regeneration.

Free valences at the edge of the graphitic layers of microcystalline carbon cause the layer edges to be very reactive, and to form surface oxides. Acidic surface oxides are commonly formed under normal operating conditions of activated carbon systems. These oxides were studied to determine their effect on the adsorptive capacity of the activated carbon. Acidic surface oxides reduce both the adsorptive capacity, and the rate of adsorption for most pollutants, such as phenol, nitrobenzene, sodium benzene sulfonate, and dextrose. The sorptive capacity and speed of sorption of urea, however, was markedly increased. It was also discovered that the changes brought about by acidic surface oxide layers were reversible. Removal of the oxide restored the carbon to its original capacity and sometimes beyond. Results of this study indicated that the effects of acidic surface oxides depend upon: (1) type of organic pollutant being sorbed and (2) relative strength of surface oxide interactions with both the water solvent and the solute to be adsorbed. (Lowry-Texas)
W71-07078

2ND INTERNATIONAL SYMPOSIUM FOR WASTE TREATMENT LAGOONS.

Sponsored by Missouri Basin Engineering Health Council, and Federal Water Quality Administration. Edited and distributed by Ross E. McKinney, 217 Nuclear Reactor Center, University of Kansas, Lawrence, Kansas 66044. June 23-25, 1970, Kansas City, Missouri. 404 p.

Descriptors: *Oxidation lagoons, *Waste water treatment, Performance, Efficiencies, Climatic conditions, Cost analysis, *Industrial wastes, *Domestic wastes, *Lagoons.
Identifiers: Aerated lagoons, Aerobic lagoons, Anaerobic lagoons, Facultative lagoons, Applications.

Lagoons - aerobic, anaerobic, facultative, and aerated - are discussed both as to their past history and also to their future applications. Lagooning has been applied to nearly all types of wastes both domestic and industrial with success. The main reasons for this universal application are: (1) low initial cost as long as land values are reasonable, (2) minimum maintenance expenses; and (3) long system working life. The basic design considerations for the construction of lagoons are: (1) area BOD loading; (2) temperature; (3) nature of organics present; (4) climatic conditions both as to temperature and rainfall; and (5) condition of the soil upon which the lagoons are to be built. Papers presented at the symposium cover the full range of opinions, from both proponents and opponents. Design criteria are presented for nearly every type of system configuration imaginable. The underlying theme, however, has been one of recognition of the need for more detailed and complete experimental and investigation to more fully define lagoon performance and operation. (See also W71-07076 thru W71-07127) (Lowry-Texas)
W71-07079

WASTE WATER TREATMENT AND WATER POLLUTION IN THE UNITED STATES,
Federal Water Quality Administration, Washington, D.C. Water Quality and Research.
Rienhold W. Thieme.
In: 2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 4-7.

Descriptors: *Waste water treatment, *Population, Water resources development, River basin commissions, Cost sharing, Government finance, Erosion control, Sedimentation, Farm wastes, M

icipal wastes, Industrial wastes, Planning, Re-ions, *Water pollution treatment.
dentifiers: *Regional planning, Federal financing, Municipal bonds, Combined sewers, Air flotation, Screening.

The population explosion is making it more and more imperative for the United States to require a greater degree of treatment of waste products from all areas. As the population grows, the water supply stays constant. Therefore, none of it can be wasted by polluting it. The government has started the movement toward cleaner water by helping state and local agencies with the financing and the technical problems involved in building a waste treatment facility. The preoccupation with the present has given way in many instances to a much more realistic view of long range future planning. The regional basin plans help to assure that money spent in one area will not be wasted. Only by turning her vast technology and manpower to the areas of natural conservation and pollution control will the United States be able to stave off disaster and famine in the coming decades. The old line policies of exploiting natural resources in such a manner as to yield the largest profit must give way to the new era of judicious management of the dwindling resources that are left. (See also W71-07079) (Lowry-Texas)
W71-07080

HE ROLE OF PONDS IN WASTE WATER REATMENT,
outh Dakota Dept. of Health. Div. of Sanitary En-neering.
. O. Allum, and C. E. Carl.
: 2nd International Symposium for Waste Treat-ent Lagoons, June 23-25, 1970, Kansas City, Mis-uri, p 7-10. 11 ref.

escriptors: *Ponds, *Waste water treatment, Or-anic loading, Maintenance, Dissolved oxygen, dor, Anaerobic conditions, Aerobic conditions, ost analysis, Municipal wastes, Industrial wastes, South Dakota.
dentifiers: Real estate values, Polishing.

Man made ponds designed for waste treatment ave a wide variety of application to a wide range f wastes. South Dakota has state regulations overning the loading on such ponds, but little her care or maintenance is required at these in-allations. Pond sizes range from about .08 acres 284 acres, and provide efficient treatment for mmunities whether they are overnight camp rounds, or cities of 10 to 15,000 population. onds have also been used for many industrial aste problems. Slaughter house wastes, food rocessing wastes, sugar beet processing wastes, henols, and many other different industrial scharges have been successfully treated in ponds. eriodic inspection and repair of the dikes is vir-ally the only required maintenance. The cost of onds is almost totally dependent upon land costs, nd is therefore particularly suited to South akota's comparatively inexpensive land situation. he only serious drawback of ponds is their spring lor problems. These problems also occur during verloading, even though overall treatment may ill be quite good. (See also W71-07079) (Lowry-exas)
71-07081

DECADE OF CHANGE IN WASTE STA-ILIZATION LAGOONS IN THE MISSOURI IVER BASIN,
orth Dakota State Dept. of Health. Environmen-l Health and Engineering Services.
. Van Heuvelen.
nd International Symposium for Waste Treatment agoons, June 23-25, 1970, Kansas City, Missouri, 10-13.

escriptors: *Oxidation lagoons, *Waste water eatment, Odor, Seepage, Maintenance, Organic ading, Coliforms, Municipal wastes, Industrial astes, Anaerobic conditions, Aerobic conditions, issouri River.
Identifiers: *Aerated lagoons, Land values, *Missouri River basin.

Prior to 1950, the use of lagoons for waste treatment was generally discouraged in the United States. Between 1950 and 1960 increased interest in the design and operation of lagoons became evident. In 1960, there were 469 lagoons in the Missouri River Basin, and in 1970, there were 1,749. Each individual state usually has control over the critical design parameters. Much variation has been observed with respect to area and loading rates, depth, bottom and seepage control, location, multiple unit installation, etc. Benefits accruing to the states and municipalities from the use of lagoons include low initial cost, little or no maintenance, no problems with shock loading, no need for highly skilled operators and storage capacity sufficient to hold waste until desired time of discharge. Lagoons have aided many municipalities to treat effluents that otherwise would have remained untreated. Their usage is still on the increase and will probably remain so as long as land values permit them to be economically constructed. (See also W71-07079) (Lowry-Texas)
W71-07082

THE ROLE OF OXIDATION PONDS IN IMPROVING ENVIRONMENTAL HEALTH IN DEVELOPING COUNTRIES,
World Health Organization, Geneva (Switzerland).
P. A. Stevens.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 13-15. 1 tab.

Descriptors: *Oxidation lagoons, *Environmental sanitation, Population, Economic feasibility, Vectors (Biology), Snails, Sewage systems, Waste water treatment, Fertilization, Evaporation.
Identifiers: *Underdeveloped nations, Hygiene, Disease transmission, Flies.

Less than 10% of the population of most developing countries had piped water in their houses by 1962, and only a fraction of these had sewers. What sewers were available were constructed mainly to transport wastes back onto the land for irrigation. Oxidation ponds provide an economical solution for areas of this nature, but in addition to the usual construction and maintenance problems, engineers often have an acceptance problem also. Before any treatment facility can be built the population to be so serviced must want it. In many instances this is not the case. Add to this the fact that in arid areas, evaporation from the top of the pools allows precious water to be lost, waste stabilization removes nutrients from the peasant's only source of fertilizer, and the treatment of wastes becomes an economic disadvantage. At present, many countries are using waste stabilization ponds, and all reports indicate that they are economically and technically feasible. However, the overall needs, demands, and customs of a particular area must be accounted for before such a facility can be a success. (See also W71-07079) (Lowry-Texas)
W71-07083

DYNAMIC BEHAVIOUR OF OXIDATION PONDS,
Cape Town Univ. (South Africa).
G. v. R. Marais.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 15-46. 28 fig, 14 ref, append.

Descriptors: *Oxidation lagoons, *Mathematical models, *Computer simulation, Mixing, Turbulence, Temperature, Stratification, Solar radiation, Algae, Photosynthesis, Anaerobic conditions, Aerobic conditions, Sludge, Waste water treatment, Biodegradation, Biochemical oxygen demand.

A computer model of oxidation ponds stimulated interest in several parameters which were not previously considered to be important. Data was collected from the Maters North Pond in Lusaka, Zambia, and then analyzed and used to develop the computer model. This model clearly demonstrated that (1) mixing in the pond demands much greater attention as an influential parameter with respect to both the theoretical and the practical aspects, (2) advent of anaerobic conditions in aerobic oxidation ponds is a much more complex phenomenon than was previously supposed, being dependent upon temperature, mixing, algal growth and BOD in the pond, and possibly other parameters, (3) the sludge layer occupies an important position in the degradation process and directs attention to the benefits in partial separation by anaerobic pretreatment. (See also W71-07079) (Lowry-Texas)
W71-07084

DEVELOPMENT OF LAGOON DESIGN STANDARDS IN UTAH,
Utah Water Pollution Committee, Salt Lake City.
Calvin K. Sudweeks.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 46-54. 3 tab.

Descriptors: *Oxidation lagoons, *Design standards, *Waste water treatment, Municipal wastes, Organic loading, Mixing, Temperature, Precipitation, Permeability, Seepage, Groundwater, Sulfates, Coliforms, Chlorination, Biochemical oxygen demand, *Utah.
Identifiers: Logan (Utah).

The stream conditions in Utah are such that in many areas, the effluent from a waste treatment facility may be most, or in some cases, all of the total flow of the stream for much of the year. Because of this, the water quality standards of that state must be extremely stringent. As lagooning became more popular as a waste treatment device, appropriate controls were needed, but there was no information readily available concerning acceptable design standards and operational practices for aerobic lagoons. Other states were then consulted as to their practices, and the installations already functioning in Utah at that time were studied to determine what reasonable standards might be evolved. Because of the limitation of knowledge in the area, all projects sanctioned by the state are subject to testing after completion before they are finally accepted. The complete set of regulations of the state of Utah at the present time is presented along with some of the data used to arrive at these regulations. (See also W71-07079) (Lowry-Texas)
W71-07085

QUALITY PERFORMANCE OF WASTE STABILIZATION LAGOONS IN MICHIGAN,
Michigan State Dept. of Health.
Maurice S. Richmond.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 54-63. 12 fig.

Descriptors: *Oxidation lagoons, *Performance, Waste water treatment, Seepage, Odors, Percolation, Evaporation, Anaerobic conditions, Aerobic conditions, Coliforms, Fecal coliforms, Phosphates, Sampling, Hydrogen ion concentration, Biochemical oxygen demand, *Michigan.
Identifiers: *Data analysis, Total suspended solids.

A performance review of lagoons in Michigan during the period of 1961-1970 was made. The objective was to determine lagoon performance in general, and more specifically, to determine optimum conditions with respect to design and operational control under Michigan climatic conditions. DO, BOD, TSS, VSS, pH, total coliforms, and fecal coliform tests were the parameters that have been used to determine the effluent quality of water in the lagoon, and the water discharged semiannually in the late fall and early spring. The total hydraulic retention of flow is approximately 6 months. A significant fact revealed in this study was that lagoons are providing waste water treatment at least equivalent to, and in some cases better than, that

provided by conventional secondary treatment, including removal or reduction of BOD, TSS, and coliforms. One reason for this is the complete elimination of any effluent what so ever during the extensive period of total retention. By discharging during the spring and fall, maximum flows permit maximum natural degradation with minimum pollutional problems. (See also W71-07079) (Lowry-Texas)
W71-07086

EVALUATION OF LAGOON PERFORMANCE IN LIGHT OF 1965 WATER QUALITY ACT,
Ryckman, Edgerley, Tomlinson and Associates, Clayton, Mo.
G. M. Barsom, and D. W. Ryckman.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 63-80. 11 fig, 8 tab, 61 ref. USPHS Grant EH 66-611.

Descriptors: *Oxidation lagoons, *Water quality act, Waste water treatment, Eutrophication, Odors, Nitrogen, Phosphorus, Chemical oxygen demand, Biochemical oxygen demand, Mixing, Missouri.
Identifiers: *Putrefaction, Illumination, Suspended solids, Volatile suspended solids.

The bulk of the work done in the last three decades on oxidation ponds has been concerned primarily with (1) algal production and classification, and (2) development of design criteria for organic and hydraulic loadings of oxidation ponds. Lagoon performance has never been evaluated from the position of water quality criteria; nor has a comprehensive effort been made to evaluate the physical, chemical, and biological limiting factors which define lagoon performance. Therefore an evaluation program was devised to rate lagoons on the basis of water quality criteria and also on aesthetic success or failure. Lagoons in varying locations were studied for extended periods of time and evaluated. The following observations were made based on the evaluations: (1) effluent 5 day BOD from lagoons greatly exceeded the accepted effluent BOD standards, as did suspended solids both in the case of raw sewage, and tertiary oxidation ponds, and (2) removal of phosphates, nitrates, and coliforms was both in-effective and erratic. Based upon reduction of COD SS, VSS, nitrogen, and phosphorus, oxidation ponds did not significantly enhance water quality, and as presently designed, such ponds will not enhance, restore, or even maintain the present quality of receiving waters. (See also W71-07079) (Lowry-Texas)
W71-07087

FIELD STUDIES ON STABILIZATION PONDS IN SOUTH INDIA,
Missouri Univ., Rolla. Dept. of Civil Engineering.
Krishnier Purushothaman.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 80-88. 5 fig, 7 tab, 9 ref.

Descriptors: *Oxidation lagoons, Performance, *Climatic zones, Sampling, Saturation, Microorganisms, Coliforms, Biochemical oxygen demand, Dissolved oxygen, *Organic loading, Anaerobic conditions, Aerobic conditions, Depth, Waste water treatment.
Identifiers: *India, Detention time, Suspended solids.

Four experimental waste stabilization ponds were constructed at the College of Engineering, Guindy, Madras, India. Samples of the effluent and influent were obtained periodically, and analyzed for BOD, pH, and dissolved oxygen. The data was then recorded and studied to obtain information on organic and hydraulic loading, detention time, dissolved oxygen, and other parameters necessary in determining design criteria and lagoon performance. From the previously described tests, it was found that (1) when climatic conditions are favorable, lagoon loading can be increased to as much as 400% of the normal loading rates, (2) pond depth has no influence on operating efficiency under the conditions studied, (3) BOD removal efficiency was not affected by varying the detention time from 2 to 9 days, (4) dissolved oxygen was as much as 400% supersaturated during the day, but decreased to zero at night, (5) bacteria and coliform reductions were not affected by varying either depth, detention, or both, and (6) no correlation was discovered between organic loading rate, and the predominant phyto-and zoo-planktons. (see also W71-07079) (Lowry-Texas)
W71-07088

A DECADE OF STABILIZATION LAGOONS IN MICHIGAN WITH IRRIGATION AS ULTIMATE DISPOSAL OF EFFLUENT,
Williams and Works, Grand Rapids, Mich.
Earl A. Myers, and T. C. Williams.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 89-92. 1 tab, 8 ref.

Descriptors: *Waste water (Irrigation), *Oxidation lagoons, Rates of application, Crop production, *Irrigation practices, Return, *Water reuse, Recharge, Adsorption, Seepage, Erosion, Infiltration, Percolation, Sprinkler irrigation, Monitoring, Geology, Nitrogen, Phosphorus, Aerobic conditions, Anaerobic conditions, Waste water treatment, *Michigan.
Identifiers: Renovation.

The Michigan consulting engineering firm of Williams and Works has designed 28 stabilization lagoon type sewage treatment facilities, with 15 more to built shortly. All have been designed for nominal loadings of 20 lbs BOD/day/acre of water surface, and most of them have been designed for semi-annual discharge of lagoon effluent. Because of the increasingly stringent laws concerning the allowable amount of phosphorus present in waste effluent discharged to streams, irrigation has frequently been specified as a means of ultimate disposal. In the 4-R cycle of return, recycle, renovation, and reuse, irrigation plays a major role. By irrigating crops with treated effluent, the major portions of the excess nutrients such as phosphorus and nitrogen, are removed either by adsorbing into the soil particles or by utilization by the plants themselves. This process must be carefully planned and operated, both in the selection of the soil to be used and the crop to be planted, and also in the application rate. After removal in this manner, the water then either percolates through the ground and back into the groundwater table, or is drained off in surface channels to a receiving body of water. The irrigation of treated effluent depends upon the topography of the land, the type of irrigation system used, the type of crop which is able to grow in a certain area, and many other factors. However, when carefully designed, constructed, and operated, it can provide excellent treatment of lagoon effluent to insure its subsequent reuse. (See also W71-07079) (Lowry-Texas)
W71-07089

A DECADE OF RALSTON PURINA LAGOON EXPERIENCE,
Ralston Purina Co., St. Louis, Mo.
C. B. Smith.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 93-95. 3 fig.

Descriptors: *Oxidation lagoons, *Industrial wastes, *Organic loading, Odors, Maintenance, Aeration, Drawdown, Domestic wastes, Biochemical oxygen demand, Cooling water, Anaerobic conditions, Aerobic conditions, Waste water treatment, Alabama.
Identifiers: *Food processing wastes, Tussville (Alabama).

21 lagoon systems are owned or utilized by Ralston Purina Co. Types of wastes being treated are chicken and turkey dressing plant wastes, dairy wastes, rendering plant wastes, hog, dog, and cat wastes, Mink Chow mixing plant wastes, and human sewage. Lagoons, usually around 6' deep are operated at loading rates of approximately 1000 lb BOD/acre/day, with detention time between 5 and 10 days. The advantages of lagoon systems are, (1) high degree of treatment, (2) lack of odor, (3) low maintenance cost, (4) ability to handle shock loads, (5) lagoons can be utilized as a source of cooling water for condenser operation, (6) low initial cost if land is reasonable priced. Details of the construction practices of Ralston Purina's lagoon systems are included along with one specific example system located at Trussville, Alabama. (See also W71-07079) (Lowry-Texas)
W71-07090

A COMPARISON OF AN EFFICIENT LAGOON SYSTEM WITH OTHER MEANS OF SEWAGE DISPOSAL IN SMALL TOWNS,
Bowling Green State Univ., Ohio.
Karl Schurr.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 95-100. 8 fig, 9 ref.

Descriptors: *Oxidation lagoons, *Comparative costs, Population, Sampling, Biochemical oxygen demand, Chlorides, Nitrites, Nitrates, Phosphates, Coliforms, Dissolved oxygen, Turbidity, Maintenance, Waste water treatment, *Treatment facilities.
Identifiers: Suspended solids.

An oxidation lagoon and a conventional primary secondary sewage treatment facility were compared with respect to pH, turbidity, nitrates, phosphates, nitrites, chloride, conductivity, and coliform bacteria, by comparing the final tank of the lagoon system to the receiving stream of the conventional system. The oxidation lagoon was found to provide a significantly higher degree of waste treatment at a lower cost. The results of the lagoon versus conventional treatment comparison indicate that lagoons may be of significant value in smaller towns and cities where economy is essential. In most of the smaller towns, land values are within the range of price where economical lagoons may be built. Other attractive features of lagoons are their low maintenance costs, and lesser labor requirements. More work is necessary to improve the efficiency of lagoons, but they are already a promising alternative to areas which need treatment facilities but cannot afford conventional plants. (See also W71-07079) (Lowry-Texas)
W71-07091

CARBON BUDGET AND TOTAL PRODUCTIVITY OF AN ESTUARINE OXIDATION POND RECEIVING SECONDARY SEWAGE EFFLUENT,
Institute for Environmental Health Studies, Morehead City, N.C.
John W. Day, Jr., Charles M. Weiss, and H. T. Odum.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 100-113. 15 fig, 15 ref. Public Health Service Training Grant ES 61, National Science Foundation Sea Grant GH18, North Carolina Board of Science and Technology Grant RA005.

Descriptors: *Oxidation lagoons, *Computer models, *Mathematical model, Light intensity, Dissolved oxygen, Hydrogen ion concentration, Temperature, Carbon dioxide, Eutrophication, Respiration, Photosynthesis, Evaporation, Sedimentation, Waste water treatment, *Estuarine environment, Computer programs.
Identifiers: Differential equations, Inorganic carbon, Organic carbon.

A waste stabilization lagoon was modeled on a digital computer in PL/1 computer language. Included in the program are constants for influent light intensity, rate of respiration, rate of photosynthesis, and other parameters. All of the constants were determined from experimental st

lies of existing waste stabilization lagoons. These tudies were performed in their entirety for over a ear. The data was then analyzed and arranged to rrive at the desired constants. Development of a nodel which was deemed a satisfactory representa- ion of the pond system allowed work to be done on he effect which various outside stimuli will have on ystem performance, with the desired end result eing the prediction of changes which will be un- ergone by aquatic environments receiving a cer- ain waste flow. The model may also be used to letermine avenues of further investigation in as- essing the effects of treated sewage on estuarine ystems. (See also W71-07079) (Lowry-Texas)
W71-07092

TABILIZATION POND DESIGN CRITERIA OR TROPICAL ASIA,
sian Inst. of Tech., Bangkok (Thailand). Dept. of nvironmental Engineering.
. G. McGarry, and M. B. Pescod.
nd International Symposium for Waste Treatment agoons, June 23-25, 1970, Kansas City, Missouri, 114-132. 15 fig, 6 tab, 38 ref.

Descriptors: *Oxidation lagoons, *Aesthetics, Odors, Temperature, Organic loading, Depth, Temperate zones, Tropic zones, Comparative osts, Hydrogen ion concentration, Biochemical xygen demand, Anaerobic conditions, Aerobic onditions, Recirculated water, Waste water treat- ent.
dentifiers: Facultative ponds, *Asia.

Current literature on waste water treatment using naerobic, facultative, or anaerobic-aerobic agoons was examined to determine what changes n design criteria were possible for the Asian en- ironment. From these studies, the following con- lusions were drawn for anaerobic ponds: (1) areal OD laoding maintains the greatest influence on real BOD removal, with influent pH and hydraulic etention period being less significant, (2) the max- mum areal BOD laoding which will still allow the ond to stay above pH 6 will give greatest areal OD removal, (3) maintaining maximum BOD on ll stages gives greatest removal and most efficient nd use, (4) recirculation of pond effluent will ecrease odors but will decrease BOD removal lso. For facultative ponds, equations were eveloped for maximum BOD removal with respect o both temperature and areal BOD loading. For any developing countries, the use of oxidation agoons present and economical solution to pollu- on problems. Land restrictions, in many instances orce consideration of anaerobic lagoons, but the opulations of most developing countries are less onscious of aesthetics than those of developed ountried. (See also W71-07079) (Lowry-Texas)
W71-07093

URVIVAL OF ENTERIC BACTERIA AND IRUSES IN MUNICIPAL SEWAGE LAGOONS,
lew Hampshire Univ., Durham. Dept. of Microbiology.
. W. Slanetz, Clara H. Bartley, T. G. Metcalf, and . Nesman.
nd International Symposium for Waste Treatment agoons, June 23-25, 1970, Kansas City, Missouri, 132-141. 6 fig, 6 tab, 12 ref.

Descriptors: *Oxidation lagoons, *Temperature, Pathogenic bacteria, Coliforms, Salmonellae, En- eric bacteria, Stagnant water, Seepage, Membrane ilters, Waste water treatment, Municipal wastes.
dentifiers: *Enteric viruses, *Multi-stage lagoons, urvival rates, Fecal streptococci, Fecal coliforms.

amples were taken from the oxidation lagoons of hree communities, one community having a single ond, one a three pond series, and one a four pond eries. The samples were analyzed for coliforms, ecal coliforms, fecal streptococci, salmonellae, nd enteric viruses. The results were arranged in abular form and analyzed for % removal. Die-off f coliforms ranged from 95-99% for one or two tage ponds in series at 17 to 26 C. Salmonellae and enteric viruses were isolated at all seasons from the majority of effluent samples. Coliforms showed a marked increase in survival rate during the winter temperatures of 1 to 10 C. In the three or four pond series, counts at 10 to 26 C were as low as two/ml or less for coliforms, fecal coliforms, and fecal streptococci. Salmonellae were isolated from only one out of 24 samples from the third or fourth pond during the summer periods, but the numbers of indicator organisms, and the frequency of isolation of pathogens was appreciably higher during the winter. Also, a significant number of enteric viruses were isolated from samples year around. Therefore, oxidation pond effluent discharged directly to receiving water may create health hazards. (See also W71-07079) (Lowry-Texas)
W71-07094

BACTERIA REMOVAL IN OXIDATION PONDS,
Federal Water Quality Administration, Washington, D.C.
John A. Little, Bobby G. Carrol, and Ralph E. Gentry.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 141-151. 10 fig, 2 tab, 8 ref.

Descriptors: *Oxidation lagoons, *Coliforms, Sampling, Membrane filter, Bacteria, Organic loading, Mixing, Waste water treatment, Biochemical oxygen demand.
Identifiers: Multi-cell ponds, Short-circuiting, Detention time, Most probable number, Fecal coliforms.

Nine stabilization ponds throughout the Southeastern United States were analyzed including single cell ponds, and multi-stage ponds both in series and in parallel. Grab samples of influent and effluent were measured for both total and fecal coliforms by both the MPN method and also the membrane filter method. Sampling was spread over a two year period with more than 600 samples taken and analyzed. Dilution capacities in excess of a thousand fold would be needed to prevent effluent from single celled ponds from far exceeding present water quality criteria. Multi-stage series ponds significantly enhanced removals of both fecal and total coliforms, and are highly recommended for converting single stage ponds. Also, effluent bacterial densities varied by an order of magnitude from one moment to the next in single stage ponds, indicating considerable short-circuiting problems in the single stage reactors. Organic loading has little or no effect upon effluent bacterial concentration, the most significant parameter being true detention time. Improvement was needed also in the overflow weirs, since floating solids in many cases were passed directly through the system. From the above factors, it was concluded that effluent chlorination could be needed in some cases, but that the individual situation must be studied to determine the need. (See also W71-07079) (Lowry-Texas)
W71-07095

CHLORINATION OF WASTE POND EFFLUENTS,
Sacramento State Coll., Calif.
Leonard W. Hom.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 151-159. 7 fig, 4 tab, 15 ref. National Science Foundation Grant GY3799, National Institute of Health, USPHS, WP00026-RS.

Descriptors: *Oxidation lagoons, *Disinfection, Degradation, Chlorine, Contact time, Sampling, Coliforms, Bacteria, Oxidation, Organic loading, Algae, Waste water treatment, Biochemical oxygen demand.
Identifiers: *Residual, Most probable number.

A two year series of tests were performed on effluent from experimental stabilization lagoons of the City of Concord, California, in an attempt to determine methods for controlling algae kill by controlling chlorine dosage. Three day composite samples, of 500 ml volume, were taken at three-hour intervals, and the chlorine demand was determined by the OT test using a 30 min. contact time. In addition, the samples were analyzed for BOD levels and for coliform population. Selective chlorination of stabilization lagoon effluents can be accomplished. Control of reaction and chlorine concentration is critical, since excessive chlorine can release nutrients from algal cells, thereby increasing the BOD. The solution lies in experimental optimization of both chlorine dosage and residual chlorine concentrations. Time-concentration relationships reported here provide a rational set of process design parameters for chlorine disinfection in algal-bacterial systems. (See also W71-07079) (Lowry-Texas)
W71-07096

EFFECT OF LAGOON EFFLUENT ON A RECEIVING STREAM,
Missouri Univ., Columbia.
Darrell L. King, Allen J. Tolmsoff, and Michael J. Atherton.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 159-167. 5 fig, 4 tab, 3 ref.

Descriptors: *Oxidation lagoons, *Algae, *Trickling filters, Eutrophication, Photosynthesis, Dissolved oxygen, Sedimentation, Sampling, Chemical oxygen demand, Biochemical oxygen demand, Stabilization ponds, Microorganisms, Biodegradation, Waste water treatment, Water pollution effects.
Identifiers: *Riffles, *Caloric content.

Bear Creek, a small stream whose flow is 21.5% lagoon effluent and seepage, was the site of a 90 day study which attempted to determine what stream parameters or characteristics were altered by lagoon effluent. Parameters monitored were, BOD, COD, and also volatile, suspended, and other solids measurements. The oxygen demands of the various constituents were then calculated and analyzed. From these experiments, it was determined that receiving streams for algae-laden effluents can be significantly influenced from several feet to several miles downstream. The amount of flow in the stream, and the riffle-pool ratio were found to be the factors which determine the distance downstream which a stream will be affected. Smaller streams may be broken down into riffles, which act much like trickling filters, and pools, which are merely sedimentation and digestion units. A major point of these experiments was demonstration of the fact that the receiving stream, in many cases, is an integral part of the treatment facility and must be considered as such before the total system can be evaluated. (See also W71-07079) (Lowry-Texas)
W71-07097

EFFECTS OF OXIDATION POND EFFLUENT ON RECEIVING WATER IN THE SAN JOAQUIN RIVER ESTUARY,
Federal Water Quality Administration, Pacific Southwest Region, California/Nevada Basins Office.
Richard C. Bain, Jr., Perry L. McCarty, James A. Robertson, and William H. Pierce.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 168-180. 8 fig, 6 tab, 8 ref.

Descriptors: *Oxidation lagoons, *Oxygenation, *Algae, Depth, Temperature, Photosynthesis, Reaeration, Light penetration, Nutrients, Phosphorus, Nitrogen, Tidal waters, Chemical oxygen demand, Biochemical oxygen demand, Waste water treatment, Water pollution effects.
Identifiers: *San Joaquin River.

Oxidation pond effluent entering the San Joaquin river estuary was assumed to be a major cause of low dissolved oxygen levels, and resultant fish kills. In an effort to prove or disprove this assumption, factors considered related to dissolved oxygen con-

centration were studied. These factors included water temperature, algal population, oxygen demands, nutrients, and channel and flow characteristics. Samples were taken from the river at various times, from influent and effluent from the treatment plant, and from the oxidation lagoon. They were then analyzed for NH3-nitrogen, NO3-nitrogen, organic nitrogen, organic carbon, carbonate alkalinity, bicarbonate alkalinity, orthophosphorus, total phosphorus, 5 day BOD, 30 day BOD, and COD. From the preceding investigations, it was determined that depressed oxygen levels were the result of both physical and biological factors. Physically, the deepening of the channel reduced tidal velocity and thereby reduced turbulence and rate of natural re-oxygenation, leading to lower oxygen transfer rates. Biologically, algae thrives in both the oxidation ponds and the shallow river, but is trapped in the deeper channel where light pentration is insufficient to support it. The algae then decomposes and requires oxygen. The problem then, is a complex combination of factors which requires the system approach, if a fully comprehensive solution is to be obtained. (See also W71-07079) (Lowry-Texas)
W71-07098

MATHEMATICAL SIMULATION OF WASTE STABILIZATION PONDS,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Labs.
Joseph F. Roesler, and Herbert C. Preul.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 180-185. 20 ref.

Descriptors: *Oxidation lagoons, *Mathematical models, Mixing, Water re-use, Light intensity, Evaporation, Re-aeration, Dissolved oxygen, Algae, Anaerobic conditions, Aerobic conditions, Biodegradation, Seepage, Sludge, Cost analysis, *Biochemical oxygen demand, Waste water treatment.

The mass balance approach was used to obtain equations relating to oxidation lagoon processes. The model was based on the assumption that the influent was domestic sewage, and that an anaerobic sludge layer was formed at the bottom of the pond. Equations were derived for BOD removal by algae, anaerobic decomposition, and oxidation pond depth. In order to verify equations derived from the mass balance approach, experimental data on effluent BOD, detention time, sunlight intensity, temperature, evaporation rate, and dissolved oxygen deficiency were obtained from the literature. A computer program was then designed to evaluate the constants and the disposition of all BOD's. From the preceding equation and calculations, it was concluded that: (1) oxidation lagoons are economical to build and maintain, (2) the role of algae has been overemphasized, with re-aeration and anaerobic processes equally, if not more, important, and (3) since algae occasionally interfere with receiving stream water quality, investigations should be conducted in how to maximize anaerobic decomposition at the bottom and minimize algae production. (See also W71-07079) (Lowry-Texas)
W71-07099

DESIGNING WASTE PONDS TO MEET WATER QUALITY CRITERIA,
California Univ., Berkeley. Dept. of Sanitary Engineering and Public Health.
William J. Oswald, Aaron Meron, and Mario D. Zabat.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 186-194, 3 fig, 4 tab, 23 ref.

Descriptors: *Oxidation lagoons, *Design criteria, *Water quality, Algae, Harvesting, Depth, Temperature, Light intensity, Chemical precipitation, Hydrogen ion concentration, Coliforms, Bacteria, Photosynthesis, Organic compounds, Phosphates, Nitrates, Nutrients, Anacrobic conditions, Aerobic conditions, Biochemical oxygen demand, Waste water treatment.

The overall process of waste stabilization in oxidation lagoons was examined from a logical design standpoint. Significant factors were examined from the literature, and these included infectious agents, plant nutrients, organic chemicals, and land erosion and subsequent addition of minerals, chemicals, and silts, radioactive substances, and heat pollution. In each case, design practices both from literature research and practical experience were presented. A summary of the three years of operation of the Saint Helena Waste Pond system is presented in support of the design practices previously advocated. Water quality control of a high order is consistently obtained at the Saint Helena Plant, and this control is attributed mainly to these improved design practices. Further improvement may be possible with addition of algae harvesting facilities which will also remove phosphates, but since there is little or no effluent from the ponds now the present system more thatn complies with current standards. (See also W71-07079) (Lowry-Texas)
W71-07100

CURRENT DESIGN CRITERIA FOR OXIDATION PONDS,
Federal Water Quality Administration, Washington, D.C. Construction Grants and Engineering Branch.
Evan D. Dildine, and Joseph R. Franzmathes.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 194-200. 2 fig, 2 tab, 5 ref.

Descriptors: *Oxidation lagoons, *Design criteria, Stabilization ponds, Seepage, Permeability, Evaporation, Erosion, Percolation, Mixing, Temperature, Anaerobic conditions, Aerobic conditions, Dikes, Waste water treatment.
Identifiers: *Multi-cell ponds, Start-up problems.

A brief overview of the design and operation of oxidation lagoons is presented. In the past, design of these facilities was largely a matter of chance, with experience being the best teacher in determining the final design. Now, however, with the advent of even more stringent pollution control laws, there must be analytical tests devised in order to measure pond performance and determine more fully the critical parameters involved in the design of such facilities. Although the problems associated with evolving these new design criteria are many, it is believed that under favorable conditions of climate and land values, stabilization ponds will continue to play a major role both in providing economical waste water treatment for small communities, and in helping to alleviate pollutional problems. (See also W71-07079) (Lowry-Texas)
W71-07101

NEW EXPERIMENTAL POND DATA,
Texas Univ., Austin. Environmental Health Engineering Research Lab.
E. F. Gloyna, and J. Aguirre.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 200-210. 3 fig, 10 tab, 10 ref.

Descriptors: *Oxidation lagoons, *Sludge, Anaerobic conditions, Aerobic conditions, Pilot plants, Algae, Hydrogen ion concentration, Chemical oxygen demand, *Biochemical oxygen demand, Mixing, Sampling, Organic loading.
Identifiers: Laboratory scale, *Total organic carbon.

Three laboratory-scale units and three pilot-scale unites were constructed and operated for a period of eight months at the conventionally accepted loading rates of 70 lbs BODu/acre/day and 65 day detention time for the pilot scale plants, with only 10 lbs BODu/acre/day and 90 days detention time in the lab scale units. The only difference in the three units was the location of the anaerobic sludge deposition zone. Organic removal efficiencies were determined by tests on BOD5, COD, and TOC. Suspended solids removal was determined by membrane filter analysis, and general pond characteristics were evaluated through measurement of pH, DO, temperature, nitrogen, phosphorus, and algae typing. From this experimental evaluation, it was determined that pilot scale systems are of considerable value in arriving at design criteria for a particular waste in a particular locality. Pilot plants lack many of the disadvantage of lab scale plants mainly due to the increased size, and therefore, decreased sensitivity of the pilot plants. Also, series arrangement of a multiple pond system had a much greater effect than did changing the location of the sludge deposition zone. One of the pond systems utilized for this study operated on the same principal as a series pond arrangement, and the anaerobic pretreatment portion of the system provided 50 to 76% reduction of organic material in from 3 to 5 days between 12 and 24C. (See also W71-07079) (Lowry-Texas)
W71-07102

THEORY OF AERATED LAGOONS,
Black and Veatch, Kansas City, Mo.
Henry Benjes, Jr.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 210-217. 6 fig, 1 tab, 19 ref.

Descriptors: *Oxidation lagoons, *Mathematical models, Turbulence, Mixing, Organic loading, Aeration, Dissolved oxygen, Sedimentation, Biochemical oxygen demand, Aerobic conditions, Anaerobic conditions, Sludge, Waste water treatment.
Identifiers: Aerated oxidation ponds, Facultative aerated lagoons.

Completely mixed aerated lagoons, facultative aerated lagoons, and aerated oxidation ponds have been designated as the major categories of aerated lagoons. Equations for the completely mixed aerated lagoon have been developed by three different individuals, and all three equations differ in some respect. Types of mixing equipment used, and levels of mixing provided have been demonstrated to be at least as, or possible more important than the aeration considerations. Large slower moving impellers were shown to be more efficient mixing devices than either fast moving small impellers or air diffusion devices. Facultative lagoons require less power and provide excellent treatment for wastes having a high concentration of settleable of organic settleable solids. However, the complexity of the system makes it necessarily harder to define, and as a consequence, most facultative lagoons are based on empirical design parameters. The aerated oxidation pond merely behaves like a high rate oxidation pond, drawing its oxygen supply during the warm months primarily from its algal growth, and providing satisfactory treatment even when loaded as high as 1000 lbs BOD/acre. (See also W71-07079) (Lowry-Texas)
W71-07103

AERATED LAGOONS IN ONTARIO-DESIGN AND PERFORMANCE CONSIDERATIONS,
Ontario Water Resources Commission, Toronto Div. of Research.
B. I. Boyko, and J. W. G. Rupke.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 218-220.

Descriptors: *Oxidation lagoons, *Design criteria, Organic loading, Turbulence, Mixing, Aeration, Dissolved oxygen, Aerobic conditions, Anaerobic conditions, Sludge, Odors, Municipal wastes, Industrial wastes, Biochemical oxygen demand.
Identifiers: Multi-cell lagoons, *Ontario (Canada).

Virtually all aerated lagoons in Ontario were constructed within the last ten years. Many such installations were expected to provide total treatment of wastes, and even single stage lagoons were constructed to treat high strength industrial wastes. After ten years of experience, it is now accepted that (1) lagoons do not require 100% of treatment of organic wastes, and (2) multi-stage lagoons pro-

de a much higher degree of treatment than do sin-
le stage installations. A volumetric loading of 2lb
OD/1000 cu. ft. is now the accepted design stan-
ard which will provide satisfactory effluent quali-
. However, in cases where both municipal and in-
ustrial wastes are to be treated together, the
reliminary biodegradability studies should be per-
ormed on a representative sample in order to
void having to put in too much mixing capacity,
hereby disturbing the anaerobic sludge layer, in
rder to satisfy the oxygen demand. (See also W71-
7079) (Lowry-Texas)
/71-07104

LASKA SEWAGE LAGOONS,
ederal Water Quality Administration, College,
laska. Alaska Water Lab.
dney E. Clark, Harold J. Coutts, and Robert
ckson.
nd International Symposium for Waste Treatment
agoons, June 23-25, 1970, Kansas City, Missouri,
221-231. 4 fig, 2 tab, 31 ref.

escriptors: *Sewage lagoons, *Oxidation lagoons,
Alaska, Subartic, Climatic zones, Organic load-
g, Eutrophication, Temperature, Mixing,
utrients, Odor, Bacteria, Pathogenic bacteria,
udge, Anaerobic conditions, Aerobic conditions,
iochemical oxygen demand, Waste water treat-
ent.
entifiers: Aerated lagoons, Facultative lagoons.

everal lagoons for waste treatment, aerated,
naerobic, and facultative, were studied to deter-
ine the feasibility of their application to colder
imates. Aerated lagoons were found to provide
eatment in the summer time of 80 to 88%, and
movals of 80 to 90% during the winter using gross
ubble air diffusion systems. Non-aerated lagoons,
owever, must be designed for total retention of
astes in the winter since virtually no treatment
kes place then. The optimum system studied was
multicelled lagoon providing for a shallow treat-
ent lagoon for summer treatment and a large
inter lagoon for storage. The loading on such an
stallation was found to be less than 50 lbs
OD/acre/day to provide maximum treatment
nefits. Higher loadings resulted in increasing
lor problems. Selection of rugged equipment in
rder to minimize breakdown and repairs is essen-
al to this type of operation, since maintenance is
e largest cost involved. (See also W71-07079)
Lowry-Texas)
/71-07105

RATIONAL APPROACH TO THE DESIGN OF ERATED LAGOONS,
orps of Engineers, Anchorage, Alaska. Sanitary
nd Civil Engineering Section.
dward F. Pohl.
nd International Symposium for Waste Treatment
agoons, June 23-25, 1970, Kansas City, Missouri,
231-243. 9 fig, 3 tab, 26 ref.

escriptors: *Oxidation lagoons, *Oxygenation,
issolved oxygen, Saturation, Algae, Methane bac-
ria, Eutrophication, Nitrates, Phosphates,
iodegradation, Anaerobic conditions, Aerobic
onditions, Sludge, Light intensity, Coliforms,
iochemical oxygen demand, Waste water treat-
ent.
entifiers: *Aerated lagoons, Suspended solids.

he various parameters involved in the design of
erated lagoons were investigated with particular
ference to the use of air diffused into the lagoon
rough lengths of tubing. It was determined that a
esign for an aerated lagoon should evolve in three
ages, each to be evaluated for summer and winter
onditions. To design an aerated lagoon, the first
age involves evaluation of the receiving body by
oth the waste producers, and the agency responsi-
e for the protection of the quality of the receiving
ater. The required effluent quality determination
based on BOD, suspended solids, effluent
oliform organism count. Determination of the de-
ntion time required to achieve the stage I objec-
tives is the second stage, and the final stage in-
volves an evaluation of the oxygen needed to
supply both the aeration tank mixed liquor solids
respiration, and the benthal oxygen demand. Con-
servative overall design values are recommended
because of the gaps in the research data. Until
more research has been done to investigate the
constants and the mechanisms of the process, con-
servative estimates will continue to be recom-
mended in order to provide a larger margin of
safety. (See also W71-07079) (Lowry-Texas)
W71-07106

AERATED LAGOONS FOR POTATO PROCESSING WASTES,
Federal Water Quality Administration, Corvallis,
Oreg. Pacific Northwest Water Lab.
Kenneth A. Dostal.
2nd International Symposium for Waste Treatment
Lagoons, June 23-25, 1970, Kansas City, Missouri,
p 243-249. 2 fig, 6 tab, 6 ref.

Descriptors: *Oxidation lagoons, *Industrial
wastes, Alkalinity, Organic loading, Hydrogen ion
concentration, Nutrients, Biochemical oxygen de-
mand, Anaerobic conditions, Aerobic conditions,
Trickling filter, Cost analysis, Waste water treat-
ment.
Identifiers: *Aerated lagoons, Suspended solids,
*Potato wastes.

Pilot-scale plants were operated for two nine
month processing seasons on potato wastes. 4200
gallons of fresh water were used to process each
ton of potato wastes, producing 90 lbs of BOD, 210
lbs of COD, 110 lbs of suspended solids, .6 lbs of
total phosphates as P, and 3.5 lbs of total nitrogen
as N on the nine month average. Schematic dia-
grams of the pilot plants were constructed and are
presented. From the preceding studies, the follow-
ing conclusions were obtained: (1) either an aero-
bic lagoon or an anaerobic-aerobic lagoon series in
conjunction with primary sedimentation can
achieve as high as 90% BOD reduction, (2) both
systems are economically feasible, the choice de-
pendent upon local conditions, (3) constants
derived from this study were used to formulate
models to adequately describe BOD reduction
across the ponds, (4) chemical additions were not
required for either pH control or inorganic nutrient
adjustment; and (5) some method of suspended
solids removal will usually be required. Several full
scale installations have recently been placed in ser-
vice, but data is not yet available. (See also W71-
07079) (Lowry-Texas)
W71-07107

AERATED LAGOON TREATMENT OF LONG ISLAND DUCK WASTES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil Engineer-
ing; and Cornell Univ., Ithaca, N.Y. Dept. of
Agricultural Engineering.
Raymond C. Loehr, and Dennis D. Schulte.
2nd International Symposium for Waste Treatment
Lagoons, June 23-25, 1970, Kansas City, Missouri,
p 249-258. 7 fig, 2 tab, 11 ref.

Descriptors: *Oxidation lagoons, *Farm wastes,
Pilot plants, Chlorination, Phosphates, Mixing,
Coagulation, Flocculation, Dissolved oxygen,
Biochemical oxygen demand, Aerobic conditions,
Anaerobic conditions, Cost analysis, Design
criteria, Mathematical models, Waste water treat-
ment.
Identifiers: *Aerated lagoons, *Duck wastes.

Laboratory treatability studies were conducted in
1965 to determine the feasibility of treating duck
wastes in a number of treatment systems. Pilot
scale tests were then run on a aerated lagoon
system in 1967. The pilot plant had a 250,000 gal-
lon capacity, an 8 ft depth, and a 5 HP floating
aerator. 35% of the duck waste water systems sub-
sequently installed provided in excess of 90% BOD
reduction, and 50% provided in excess of 85%
BOD reduction, with aerator power relationships
ranging from .008 to .04 nameplate horsepower per
1000 gallons. These systems included aerated
lagoons, settling ponds, and chlorination. Studies
are presently being conducted on the new methods
of phosphate removal, with some type of removal
to be implemented as soon as possible. (See also
W71-07079) (Lowry-Texas)
W71-07108

A COMPARATIVE STUDY OF AERATED LAGOON TREATMENT OF MUNICIPAL WASTE WATERS,
Metropolitan Corp. of Greater Winnipeg
(Manitoba). Water Works and Waste Disposal Div.
G. E. Burns, R. M. Girling, A. R. Pick, and D. W.
Van Es.
2nd International Symposium for Waste Treatment
Lagoons, June 23-25, 1970, Kansas City, Missouri,
p 258-276. 14 fig, 3 tab, 6 ref.

Descriptors: *Oxidation lagoons, *Climatic zones,
*Cost analysis, Temperature, Nutrients, Dissolved
oxygen, Algae, Sludge, Oxygenation, Anaerobic
conditions, Aerobic conditions, Biochemical ox-
ygen demand, Waste water treatment.
Identifiers: *Aerated lagoons, Surface aerators.

Three pilot scale aerated lagoons were constructed
at Winnipeg, Canada to test the effect of the
Canadian prairie climatic conditions on lagoon
operation. The pilot cells were of the anaerobic-
aerobic type. Each lagoon was equipped with a dif-
ferent type of aeration system, diffused air, surface
aerators, or a combination of both. Test were con-
ducted over a 20 month period on an influent
averaging 175 mg/l BOD and 188 mg/l of
suspended solids. From the results of this investiga-
tion, it was concluded that aerated lagoons can
satisfactorily provide secondary treatment under
prairie climatic conditions. BOD removal efficien-
cy and dissolved oxygen concentration both un-
dergo a seasonal summer decline due to the build-
up of sludge during the summer months. The
prevailing consideration for economic feasibility of
an aerated lagoon system is the extent and cost im-
plications of sludge removal and disposal facilities.
Also the use of surface aerators was demonstrated
to be impractical in areas which sustain large
amounts of ice cover. Research is continuing on the
economic factors involved in sludge removal and
disposal. (See also W71-07079) (Lowry-Texas)
W71-07109

BIO-FLOTATION TREATMENT IN REFINERY WASTE WATER EFFLUENTS,
American Oil Co., Whiting, Ind.
R. C. Mallatt, and J. F. Grutsch.
2nd International Symposium for Waste Treatment
Lagoons, June 23-25, 1970, Kansas City, Missouri,
p 276-284. 14 fig, 2 tab.

Descriptors: *Oxidation lagoons, *Oil wastes, Tur-
bidity, Phenols, Odor, Biochemical oxygen de-
mand, Pilot plants, Coagulation, Emulsions,
Sludge, Phosphate, Baffles, Waste water treatment,
Incineration.
Identifiers: *Bio-flotation, API separator, Cyclone
scrubber, Skimmers.

Waste streams at the American Oil company plant
at Whiting, Indiana are separated, with sanitary
wastes going to the municipal wastes treatment
plant, and the oily process wastes being channeled
through an API separator to a biofloation unit. The
solids created in the unit are either removed by
skimming devices from the top or by accumulating
as sludge on the bottom and being removed
periodically. Brush aerators are now being installed
to provide: (1) mixing (2) oxygenation, (3) fine
bubbles for the air flotation of solids, (4) a velocity
gradient in the water. Being installed in conjunc-
tion with the brush aerators are baffles and roller
drum skimmers. To complete the treatment
process, the waste sludge is accumulated, dried,
and incinerated in a fluidized bed incinerator. No
significant cost data on the incinerator system was
available for this report, but experience gained thus
far indicated that the fluidized bed incinerator

presented a practical solution to the oily sludge disposal problem. (See also W71-07079) (Lowry-Texas)
W71-07110

CURRENT DESIGN CRITERIA FOR AERATED LAGOONS,
Burns and McDonnell Engineering Co., Kansas City, Mo.
Weston E. Goodnow.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 285-286.

Descriptors: *Oxidation lagoons, *Design criteria, Temperature, Oxygenation, Loading, Biochemical oxygen demand, Waste water treatment, Tertiary treatment.
Identifiers: *Aerated lagoons, Detention time, Short circuiting.

A brief overview of the problems facing industries, consulting firms, and municipalities with respect to design criteria for aerated lagoons is presented. Many state regulatory agencies have not yet adopted standard design criteria for the design of aerated lagoons. Several items are listed as being important for regulatory agencies to consider when adopting standard design limitations. These include loading and minimization of short circuiting, plus the factors upon which these various parameters are to be based. (See also W71-07079) (Lowry-Texas)
W71-07111

AERATED LAGOONS AT HIGH ELEVATIONS,
William B. McDowell and Associates, Boulder, Colo.
Bill F. Pearson.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 286-293.

Descriptors: *Oxidation lagoons, *Design criteria, Elevation, Atmospheric pressure, Temperature, Solubility, Oxygenation, Aeration, Ice, Mixing, Organic loading, Chlorination, Disinfection, Waste water treatment.
Identifiers: *Aerated lagoons, Shock loads, Mechanical aeration, Air diffusers.

Many small towns, resort areas, and camp grounds are located at elevations above 5000 ft. Even stricter pollution measures are demanding that these areas continually upgrade their waste water treatment facilities. Stabilization lagoons, requiring little or no maintenance, capable of absorbing shock loads, and having minimal initial cost, have been proposed as a reasonable system for such communities. However, at these higher elevations, biological activity is reduced, atmospheric pressure (and oxygen solubility) is significantly decreased, and ice cover forces anaerobic conditions from which it is hard for the lagoon to recover. Aerated lagoons, however, can handle most of the previously mentioned problems. The critical factors involved in the design of aerated lagoons are the type of aeration to be used, temperature, lagoon configuration, and disinfection of effluent. A typical design analysis of an aerated lagoon is presented as a model to be followed when evaluation of a system is to be made. (See also W71-07079) (Lowry-Texas)
W71-07112

TERTIARY TREATMENT BY AERATED LAGOON,
V. N. Wahbeh, and L. W. Weller.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 293-299. 11 fig, 3 tab, 5 ref.

Descriptors: *Oxidation lagoons, *Tertiary treatment, *Design criteria, Trickling filters, Algae, Organic loading, Odor, Coliforms, Temperature, Dissolved oxygen, Aeration, Oxygenation, Nutrients, Sedimentation, Chlorination, Slopes, Biochemical oxygen demand, Hydrogen ion concentration, Waste water treatment, Kansas.
Identifiers: *Aerated lagoons, Suspended solids.

An oxidation pond, originally designed as the treatment facility for a small community and later superceded by a high-rate trickling filter plant, was remodeled and equipped with diffused air aeration using three 600 cfm blowers. This unit provided treatment mainly for storm bypass, until it was utilized as a tertiary stage to follow the trickling filter. Tests were then conducted, using an automatic sampling device, to determine the efficiency of such an arrangement during several short testing periods. It was discovered that conventional oxidation ponds lacking aeration were ineffective in reduction of BOD, suspended solids, and inorganic nutrients unless some method of algae harvesting was employed. Aerated lagoons, however, provided in excess of 60% reduction of BOD and suspended solids, although no detectable reduction in inorganic nutrients was evidenced. Some critical parameters for design of aerated lagoons are (1) greater than 4:1 and preferably a 2:1 side slope to prevent solids deposition on the slope, and (2) minimization of water surface area prevents unwanted algal cell growth which otherwise would defeat the purpose of the use of aerated lagoons instead of oxidation lagoons. (See also W71-07079) (Lowry-Texas)
W71-07113

A SIMPLIFIED KINETIC THEORY FOR AERATED LAGOONS,
Cape Town Univ. (South Africa).
G. V. R. Marais, and M. J. Capri.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City Missouri, p 299-310. 10 fig, 11 ref.

Descriptors: *Oxidation lagoons, *Kinetics, Mathematical models, Organic loading, Sludge, Fermentation, Degradation, Dissolved oxygen, Anaerobic conditions, Aerobic conditions, Temperature, Waste water treatment, Design criteria.
Identifiers: *Operational flexibility, Completely mixed reactor, Plugflow reactor, Multi-cell reactors, Recirculation, Incremental feeding.

The operational flexibility of oxidation lagoons combined in both series and parallel operation is examined through the use of the mathematical models developed from basic reactor kinetics. The relative advantages of plug flow reactors, completely mixed reactors, and combinations of the two types are discussed in detail. Constants were evaluated from data taken from experimental lagoons in order to derive the kinetic equations. The basis for the derivation of kinetic equations and type of reactor to be used is the assumption that the degradation of biological materials in an oxidation pond is of first order. The theoretical advantages of a series reactor versus a single stage reactor were then evident. Also, a multi-cell arrangement was shown to be more capable of coping with short-term overloading both on a hydraulic and an organic basis, because of the extreme operational flexibility involved. This flexibility allowed the treatment system to actually be tailored for the specific needs of the waste to be treated. (See also W71-07079) (Lowry-Texas)
W71-07114

ANAEROBIC LAGOONS-THEORETICAL CONSIDERATIONS,
John T. Pfeffer.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 310-320. 6 fig, 6 tab, 21 ref.

Descriptors: *Anaerobic digestion, *Kinetics, Metabolism, Fermentation, Temperature, Toxicity, Alkalinity, Sulfur, Hydrogen ion concentration, Odors, Methane, Methane bacteria, Carbon dioxide, Micro-organisms, Waste water treatment, Oxidation lagoons.
Identifiers: *Anaerobic lagoons, *Environmental control, Solids retention time.

Anaerobic lagoons differ from most conventional anaerobic digestion systems only by degree of control over the operation. The operator of a conventional digester can control mixing, heating, and since these tanks are covered, oxygen can be excluded almost entirely. The anaerobic lagoon lacks this variety of environmental control, and while this lack of control lowers the cost, it also narrows the range of the applicability. Each individual installation must be carefully evaluated. Toxicity due to heavy metals, sulfides, and ammonia are not easily controlled in a lagoon system. Odor problems may also be present. Lack of temperature control means that temperature conditions must be carefully studied. Decreased temperature, and subsequent decreased biological activity results in increased sludge production per unit of organics destroyed. Waste water containing only soluble organics would require long hydraulic retention times. On the other hand, with wastes of high suspended organic load, the solids accumulated on the bottom have the benefit of greatly increased retention time, causing many materials difficult to degrade to undergo complete degradation. The advantages and disadvantages presented must all be accounted for in the final design decisions before a rational choice can be made. (See also W71-07079) (Lowry-Texas)
W71-07115

ANIMAL MANURE LAGOONS, A QUESTIONABLE TREATMENT SYSTEM,
Samual A. Hart.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 320-324. 1 tab, 19 ref.

Descriptors: *Farm wastes, *Oxidation lagoons, Organic loading, Infiltration, Evaporation, Percolation, Aeration, Oxygenation, Odors, Sprinkler irrigation, Aerobic conditions, Anaerobic conditions, Biochemical oxygen demand, Waste water treatment.
Identifiers: Aerated lagoons.

Both oxidation lagoons and oxidation ditches can be of significant value to the agriculture industry. First introduced in the early 1950's, these lagoons proved to be inexpensive to build and offer a minimum of maintenance. However, this system must be carefully designed in order to provide adequate treatment of agricultural wastes, and this care in design has not been inherent to lagoons in the past. Comprehensive field studies on cow manure have indicated that 60 ft to the third power of aerated lagoon volume is necessary to treat 1 lb BOD 5/day. In between totally mixed and aerated lagoons, and conventional oxidation lagoons are various degrees of anaerobic and aerobic treatment. Similar studies conducted on hog waste fixed loading rates at 12 ft to the third power/400 lb pig as being capable of providing sufficient treatment. Oxidation lagoons were also studied, with loading rates of 30 ft to the third power/lb BOD5. Costs for the oxidation ditch treatment are $6 per hog of aeration equipment and $ 006 per hog per day of power requirements. Overall, oxidation lagoons and ditches, and aerated lagoons can provide sufficient treatment if properly designed and maintained. (See also W71-07079) (Lowry-Texas)
W71-07116

OPERATIONAL EXPERIENCES WITH SEWAGE LAGOONS,
Dallas City Water Utilities, Tex.
C. H. Williams.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 325-332. 5 fig, 7 tab.

Descriptors: *Oxidation lagoons, *Tertiary treatment, Sludge, Mixing, Temperature, Dissolved oxygen, Anaerobic digestion, Odors, Scum, Phosphates, Cost analysis, Waste water treatment, Texas.

entifiers: *Seeding, Detention time.

ie first sludge lagoons were installed in Dallas, in 40, and were used from then until the present ne. In 1960, it became evident that they were iously overloaded. The problem then became e of what to replace them with. After much stu-, a system of lagoons was constructed for use as tiary digesters at an initial cost of $251,000. erating costs involve 100 man hours/year and 200 for electricity per year. In comparison, dry- and/or incineration of the sludge required an in- l cost of $20,000,000, and $1,000,000/year erating costs. After 7 years, 1/3 of the capacity the lagoons has been used up and now con-butes only storage for the refractory materials. A g range plan includes construction of additional lti-cell series lagoons which are further removed m populated areas. Odor control at the present tallation has been imperative since the plant is mpletely surrounded by the City of Dallas. A tter understanding of seeding of feed, mixing uirements, scum and odor control, lining of its, and the superiority of anaerobic digestion for s situation has been attained from experience h the present plant. This knowledge will be ap-ed to future plants in their design and hopefully se plants will be much improved. (See also 71-07079) (Lowry-Texas)
71-07117

GESTED SLUDGE LAGOONS,
yton, Ohio.
Fro Tossey.
d International Symposium for Waste Treatment goons, June 23-25, 1970, Kansas City, Missouri, 33-334.

scriptors: *Oxidation lagoons, *Tertiary treat-nt, *Sludge digestion, Anaerobic digestion, ors, Groundwater, Evaporation, Infiltration, Cli-tic conditions, Incineration, Air pollution, Tem-rature, Waste water treatment, Ohio.
ntifiers: *Supernatant re-cycle.

sposal of digested sludges in sludge lagoons has en accepted practice for the City of Dayton for years. The current land disposal facilities occu-15 acres and include both the lagoons and infil-tion beds where the supernatant is used to ir-ate the land. Success of sludge lagooning has en found to be dependent upon the quality of dge entering the lagoon. Inadequate primary and ondary digestion produces troublesome condi-ns in a sluge lagoon system. Solids destruction tinues within the bottom sludges, which are mated to be 20 to 25% solids, helping to al-iate problems associated with poorly digested dges. The soil through which the supernatant in-rates has shown no signs of blinding and has come quite enriched through deposition of or-ic matter. No documented evidence of ground-ter deterioration has been found but a system of ing is currently being organized to determine ether any deterioration is taking place. Lagoon-has been economical, and land disposal has ided both supernatant recycle and sludge in-eration with its associated air pollutional blems. Both practices will therefore continue to used by the City of Dayton. (See also W71-079) (Lowry-Texas)
1-07118

PERIENCES WITH ANAEROBIC LAGOONS AUSTRALIA,
ter Science Laboratories, Carlton (Australia).
D. Parker.
l International Symposium for Waste Treatment goons, June 23-25, 1970, Kansas City, Missouri, 34-347. 6 fig, 16 tab.

scriptors: *Oxidation lagoons, *Design criteria, erobic conditions, Aerobic conditions, Indus-l wastes, Municipal wastes, Hydrogen ion con-tration, Biochemical oxygen demand, rients, Odors, Organic loadings, Sludge estion, Climatic conditions, Waste water treat-nt.
ntifiers: *Australia.

A variety of Australian oxidation lagoons are discussed briefly. Data is presented from the processing of Milk and slaughterhouse wastes, vegetable and cannery wastes, textile wastes, petroleum wastes, and potato wastes, along with the municipal wastes of the surrounding areas. The 3200 acre Melbourne installation, like most of the earlier plants has an anaerobic/aerobic area ration of 1/5. However, more recent installations treating industrial wastes and where odor-free operation is essential, have been constructed on a 1/1 anaerobic to aerobic area ratio to minimize loading on the anaerobic cell. These loadings range from 400 lbs/acre/day for winter conditions in a purely anaerobic pond to 250 lb/acre/day for winter conditions in a facultative pond. Summer loadings of 400 to 800 lbs/acre/day of combined food industry and municipal wastes are common in maintaining facultative conditions. When operated within these loading limits, purely anaerobic ponds can achieve 60 - 75% BOD reduction while facultative conditions can produce a 70 to 85% reduction. Regular operational control includes pH, dissolved oxygen, sulphide, BOD, SS, and other sanitary tests, to determine operating efficiency. Sludge wastage must be practiced to assure optimum lagoon performance. This is accomplished by pumping sludge to drying beds. When properly operated, lagoons, provide efficient, economical, and odor free treatment for Australian industries and municipalities. (See also W71-07079) (Lowry-Texas)
W71-07119

ANAEROBIC LAGOON TREATMENT OF PACKINGHOUSE WASTE WATER,
Nebraska Univ., Lincoln.
Mark J. Hammer, and C. Dale Jacobsen.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 347-354. 6 fig, 3 tab, 12 ref.

Descriptors: *Oxidation lagoons, *Industrial wastes, Anaerobic conditions, Odors, Temperature, Organic loading, Hydrogen ion concentration, Nutrients, Scum, Biochemical oxygen demand, Aerobic conditions, Sludge, Bacteria, Waste water treatment.
Identifiers: *Meat processing wastes, *Multi-cell reactors, Solids retention time, Grease, Baffles.

Anaerobic lagoons are currently being used as first stage treatment processes for meat-processing waste water in rural areas. Meat processing wastes, being of relatively high temperature (80 to 85F), high strength, and containing sufficient inorganic nutrients are highly amenable to anaerobic biological degradation. However, the variability of the process waste per unit of meat processed, the operation of by-product recovery and processing units, and the total work stoppage on week-ends produces a highly variable flow with a highly variable organic content. Anaerobic lagoons, with their storage capacity, long solids retention time, and ability to survive both periods of zero loading and periods of high or 'shock' loading, are well suited to treating packing-house wastes. Ther pertinent construction parameters in anaerobic lagoon construction are: pretreatment on the waste water; lagoon dimensions, particularly liquid depth and sideslopes; and placement of inlets and outlets. Pretreatment removes some grease and lowers the solids content which would otherwise fill the lagoon. Depths of greater than 12 feet along with sideslopes of 1 to 1 are recommended and inlets are to be placed 2-3' from the floor to prevent clogging. When operated at: organic BOD loading of 20lb BOD/1000 cu ft/day, minimum hydraulic detention time of 6 days, and minimum temperature of 75F, then BOD removal efficiences of 75% or greater are attainable. (See also W71-07079) (Lowry-Texas)
W71-07120

ANAEROBIC LAGOON TREATMENT OF PACKING WASTES IN LOUISIANA,
Louisiana State Dept. of Health, New Orleans.
James F. Coerver.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 354-359. 4 fig, 3 tab, 5 ref.

Descriptors: *Oxidation lagoons, *Anaerobic conditions, Industrial wastes, Design criteria, Aerobic conditions, Odors, Sludge, Temperature, Climatic conditions, Scum, Waste water treatment, *Louisiana.
Identifiers: *Meat processing wastes, Hog units, Blood, Grease.

Since the early 1960's some 50 slaughterhouse operations in Louisiana have constructed anaerobic lagoon facilities for treatment of paunch manure, blood, fleshing, and other unsalvage by-products. Anaerobic lagoons are mainly popular because of their low initial cost, ability to handle 'shock loads,' and dependable nuisance-free performance. A Houman, Louisiana slaughterhouse already using a lagoon system was evaluated to determine temporary design criteria so that other installations might be constructed. Volume requirements were based on the number of hog units processed per week, with all other animals being measured to equivalent hog units. Lagoon volume is still based mainly upon the number of animals processed per week, but the approximate BOD loading has been found to be 300 lb BOD/acre-ft/day. At this loading, these units have provided satisfactory BOD reductions (from 76.7 to 94.3%) with a minimum of expense. (See also W71-07079) (Lowry-Texas)
W71-07121

CURRENT DESIGN CRITERIA FOR ANAEROBIC LAGOONS,
Burns and McDonnell Engineering Co., Kansas, Mo.
James E. White.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 360-363. 4 tab, 12 ref.

Descriptors: *Oxidation lagoons, *Anaerobic conditions, Design criteria, Organic loading, Depth, Temperature, Sludge, Biochemical oxygen demand, Climatic conditions, Odors, Aerobic conditions, Waste water treatment.
Identifiers: Anaerobic lagoons, Meat-processing wastes, Textile wastes, Grease.

Pollution control agencies of the government were surveyed to determine the state of development of anaerobic lagoon design criteria. Industries currently using this type of treatment were also contacted for information on loading rates, BOD removal efficiencies, etc. The information gathered revealed that: (1) none of the states contacted had published design criteria, although many had certain accepted design criteria which they followed, and (2) the industries surveyed responded with such a variety of dimensions for the measurement of organic loading that, unless the data was complete there was no way to compare one with another. The data was seldom complete. From the available literature, and from state and local agencies, it was found that: (1) the majority of states allow loading rates of 12-15 lb BOD sub 5/1000 cu ft/day with considerable variation allowed for climatic conditions, degree of isolation, etc.; (2) lagoon temperature should be above 55 to 60F to provide efficient treatment; (3) depth should be 10 to 15 ft although care should be taken not to contaminate groundwater supplies; (4) series operation of lagoons shows little or no advantage; (5) additional treatment is required for both BOD and nutrient removal before discharge to the receiving water. (See also W71-07079) (Lowry-Texas)
W71-07122

CHALLENGE FOR WASTE WATER LAGOONS,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Francis M. Middletown, and Robert L. Bunch.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 364-366.

Descriptors: *Oxidation lagoons, *Waste water treatment, *Water re-use, Biochemical oxygen demand, Organic loading, Odors, Photosynthesis, Algae, Bacteria, Chlorination, Groundwater, Cost analysis.
Identifiers: Suspended solids.

Increasing use of water has necessitated greater and greater usage of reconditioned waste water as drinking water. With this greater usage has come increasingly stricter laws regarding the quality of the effluent which a treatment facility is permitted to discharge to a receiving water. Therefore treatment methods must become more sophisticated as time goes on in order that effluents not only preserve the quality of a receiving stream, but must help to restore it. In light of these facts lagoon performance must be evaluated with respect to future conditions. Lagoons have several draw backs from a water pollution standpoint. These are: (1) although coliforms may be reduced as much as 98% in a lagoon, the water quality standards for number of organisms per milliliter may still be violated; (2) if algae is allowed to pass to the receiving stream, it may become as much of a pollutional factor as the raw waste since it contains the same amount of organic matter; (3) lagoon effluent is high in suspended solids which are both aesthetically unpleasing and oxygen demanding; (4) lagoons are a threat to groundwater quality because of the difficulty in sealing them. Until now, the most attractive feature of lagoons has been their low cost. As treatment must become more sophisticated, lagoons as presently constructed will need additional treatment which will more than offset their cost advantage. Therefore, unless significant advances are made in lagoon technology, it is doubtful if lagoons will have a place in the future. (See also W71-07079) (Lowry-Texas)
W71-07123

STATE OF THE ART-OXIDATION PONDS,
North Dakota Univ., Grand Forks. Dept. of Microbiology.
John W. Vennes.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 366-376. 3 tab, 67 ref.

Descriptors: *Oxidation lagoons, *Waste water treatment, Organic loading, Biochemical oxygen demand, Solar radiation, Nutrients, Temperature, Coliforms, Chlorination, Seepage, Percolation, Evaporation, Insects, Eutrophication, Algae.

An intensive literature search of the waste stabilization pond method of treating waste water was conducted to determine the present status of such units with regard to design criteria, operational parameters, and compliance with water pollution prevention regulations. Design considerations arrived at were: (1) 1 Langley/day of radiation is sufficient to treat 1 lb BOD/acre/day; (2) multi-stage series ponds provide the best organic and bacterial removals; (3) seepage and evaporation must be considered in lagoon design since in many cases these are the only forms of effluent; (4) chlorination while killing the bacteria, will also kill the algae which will then effect an immediate organic load on the system or the receiving stream; (5) algae removal techniques must be developed since most of the organic material is not destroyed, but merely converted to algae, as are the inorganic nutrients as well. Without algae removal, oxidation pond effluent is high in organic content which may cause deterioration of the receiving stream quality. More study is needed on the mechanisms which are utilized in oxidation ponds for the removal of organics, and also on the actual measurement of the organic loadings on the facilities before organic pollutants and micro-organisms present in pond effluents can be reliably predicted. (See also W71-07079) (Lowry-Texas)
W71-07124

STATE OF THE ART-AERATED LAGOONS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
Ross E. McKinney.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 376-381. 42 ref.

Descriptors: *Oxidation lagoons, *Design criteria, Waste water treatment, Industrial wastes, Temperature, Depth, Mixing, Oxygenation, Organic loading, Biochemical oxygen demand.
Identifiers: *Aerated lagoons, Mechanical aerators, Diffused air, Detention time, Suspended solids.

Aerated lagoons became widely accepted as a form of waste water treatment in the 1960's. Their main application so far has been in the area of industrial waste treatment. Aerated lagoons have successfully treated textile wastes, paper wastes, slaughterhouse wastes, various food wastes, and many others. Because they do not depend upon algae for oxygen, aerated lagoons are more controllable by the operator. Aeration devices have been developed to supply these basins both with mixing capacity and oxygenation capacity. The two basic types in use are mechanical surface aerators, and diffused air devices, each having its own merit. Aerated lagoons have taken a place as an established waste water treatment tool. Much work remains to be done regarding the actual mixing and oxygenation requirements, true loadings, optimum depth, etc. This type of treatment is a combination of both activated sludge and oxidation ponds, and it follows predictably the fundamental kinetics derived for these two processes. When carefully designed, constructed, and maintained, it can provide economical efficient waste treatment for a wide variety of wastes. (See also W71-07079) (Lowry-Texas)
W71-07125

STATE OF THE ART-ANAEROBIC LAGOONS,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
James N. Dornbush.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 382-387. 27 ref.

Descriptors: *Oxidation lagoons, *Anaerobic digestion, Design criteria, Depth, Organic loading, Temperature, Odors, Acidity, Alkalinity, Hydrogen ion concentration, Sludge, Scum, Mixing, Nutrients, Climatic conditions, Methane bacteria, Biochemical oxygen demand.
Identifiers: *Anaerobic lagoons, Detention time.

Anaerobic lagoons have been a natural outgrowth of aerobic lagoons as aerobic systems became overloaded beyond their aerobic capacity. However, facilities which were originally designed to be anaerobic are providing much better treatment. At present, anaerobic lagoons lack a well established well documented set of design criteria based on either field data or theoretical calculations. Therefore, much research is needed to: (1) more clearly define the thermal environment throughout lagoons so that effects of temperature changes may be predicted; (2) arrive at a better effluent and influent; (3) determine the actual detention time of organics within the system; and (4) resolve the question of the relative importance of sludge accumulations as a major source of nuisance odors. (See also W71-07079) (Lowry-Texas)
W71-07126

A FIELD STUDY OF THE PERFORMANCE OF WASTE STABILIZATION PONDS SERVING SMALL TOWNS,
Kansas State Dept. of Health. Div. of Environmental Health.
Edwin D. Lyman, Melville W. Gray, and John H. Bailey.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 387-404. 18 tab.

Descriptors: *Oxidation lagoons, *Waste water treatment, *Rural areas, Organic loading, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Dissolved oxygen, Sampling, Infiltration, Coliforms, Nutrients, Phosphorus, Nitrites, Nitrates, *Kansas, *Sewage treatment.
Identifiers: Detention time.

Rural areas in Kansas rely on waste stabilization ponds for sewage treatment quite heavily. The reasons for this are low initial cost, because of the relative availability of land; a highly skilled operator is not needed, and when properly maintained, the system has a long working life. Although lagoons are widely used, little knowledge of the performance of such systems was available. Therefore, three such lagoons were chosen for study. Composite samples were taken and analyzed for BOD, COD, NH3, nitrite and nitrate, phosphorus, coliforms, pH, and dissolved oxygen. From the preceding tests, BOD reductions of 85%, COD reductions of 65%, and coliform reductions of 99% were found to be common for Kansas's soil and climatic conditions. With long detention times, an effluent of 100 fecal coliform/100 ml can be consistently obtained. Water quality conditions in Kansas streams indicate that lagoon effluent will enhance overall quality characteristics, as determined from unfiltered samples. Lagoon effluent is currently being used as sole water supply for livestock and irrigation purposes in many areas of the state. Therefore, sacrifice of such effluent quality solely for the removal of inorganic nutrients seems hardly justifiable. (See also W71-07079) (Lowry-Texas)
W71-07127

INVESTIGATIONS OF PHENOLIC WASTE TREATMENT IN AN OXIDATION DITCH,
Instytut Metali Niezelaznych, Gliwice (Poland).
Jan Biczysko, and Jan Suschka.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, 1966, Vol 2, p 285-294. 3 fig, 3 tab, 4 ref.

Descriptors: *Phenols, *Trickling filters, Biodegradation, Organic loading, Thermophilic bacteria, Chemical oxygen demand, Dissolved oxygen, Sulfur, Temperature, Microorganisms, *Oxidation lagoons, Waste water treatment.
Identifiers: Oxidation ditch, *Plug flow, Mesophilic, Thiocyanates, Cyanides, Coking plants, Permanganate value, Sludge density.

Oxidation ditch treatment of high temperature phenolic waste streams from a coking plant preceded by a trickling filter, yielded 99.9% decomposition of volatile phenols and 97.7% decomposition of non-volatile phenols. Also, a 92% reduction in permanganate value, 90% reduction of COD, 91.2% and 90% reduction of cyanides and thiocyanates respectively, and 75, 66, and 55% average decomposition of thiosulfates, sulfites and sulfides respectively were observed during the same operation. These results were dependent upon the oxygen concentration being 1.5 mg above. The trickling filter was installed to allow the wastes to cool from the thermophilic to the mesophilic range. Thermophilic organisms in the filter reduced volatile phenols by 30%, cyanides by 50% and thiosulfates by 40%. No excess sludge was produced in this operation, and solids were present in the form of regular, distinct oval flocs which settled readily. From these investigations, future treatment of high temperature phenolic waste streams should be highly efficient if the proper oxygen supply can be maintained. (See also W71-07130 thru W71-07131) (Lowry-Texas)
W71-07128

DISCUSSION OF 'INVESTIGATIONS OF PHENOLIC WASTES TREATMENT IN AN OXIDATION DITCH',
Ebara-Infilco Co., Tokyo (Japan).
T. Ide.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, 1966, Vol 2, p 295-299. 4 fig, 1 tab.

Descriptors: *Phenols, *Activated sludge, Waste dilution, Dissolved oxygen, Nitrogen, Phosphorus,

ccclimatization, Impellers, Ureas, Hydrogen ion ncentration, *Oxidation lagoons, Waste water eatment.
lentifiers: *Sludge loading, Mixed liquor, Volatile spended solids, Complete mixing, Plug flow, rthophosphoric acid, Sparger, Stocking factory.

n activated sludge process plant for the treatment phenolic wastes has been in operation in Japan nce July 1964. Influent to the system, diluted with nitary wastes and cooling tower water, contains proximately 500 mg/l of phenols. Nutrient trogen and phosphorus are added to the system at e ratio of 4.0 and 0.5 parts respectively, per 100 rts of phenols. Dissolved oxygen concentration is 0 mg/l and pH is 6.7 to 7.3. Phenols removal of an erage of 99.8% have been obtained from this ant. This removal efficiency can be maintained hly as long as the phenol sludge loading factor is ss than 0.6 kg phenol/day/kg VSS. At this value udge production is also negligible. Above this itical loading, however, efficiency gradually ecreases, and excess sludge starts to build up. (See so W71-07128) (Lowry-Texas)
71-07129

ISCUSSION OF 'INVESTIGATIONS ON HENOLIC WASTE TREATMENT IN AN OX-DATION DITCH',
ad Homburg (West Germany).
erner Noack.
roceedings, Third International Conference on ater Pollution Research, Munich, Germany, 966, Vol 2, p 299-304. 4 tab, 7 ref.

escriptors: *Phenols, *Biodegradation, *Ac-ated sludge, Chemical wastes, Wood wastes, In-strial wastes, Temperature, Hydrogen ion con-ntration, Biochemical oxygen demand, *Oxida-n lagoons, Waste water treatment.
entifiers: Nocardia, Joint clarification, Cyanide, oking plant.

he efficiency of phenol removal was investigated r three different processes. They are: (1) high te biological clarification in an activated sludge ant; (2) biological clarification of phenol-con-ining effluents of a chemical plant with nocardia; d (3) biological clarification of coking plant ef-uent in connection with local sewage in a conven-onal activated sludge plant. The results of these vestigations can be summarized as follows: (1) gh-loading plants should be designed for 1 kg henol/day/cubic meter of clarifier, and 3 kg BOD h 5/cubic meter of clarifier; (2) the single stage ant can provide sufficient treatment; and (3) int clarification with other effluents is both onomically and aquiculturally advisable. (See so W71-07128) (Lowry-Texas)
71-07130

ISCUSSION OF 'INVESTIGATIONS ON HENOLIC WASTE TREATMENT IN AN OX-DATION DITCH',
stituut voor Gezondheidstechnick TNO, Delft Netherlands).
Pasveer.
oceedings, Third International Conference on ater Pollution Research, Munich, Germany, 966, Vol 2, p 304-308. 3 tab, 2 ref.

escriptors: *Phenols, *Dissolved oxygen, *Nitrifi-tion, Industrial wastes, Biodegradation, Organic ading, Biochemical oxygen demand, Chemical ygen demand, Bacteria, *Oxidation lagoons, aste water treatment.
entifiers: *Oxygenation capacity, Oxidation tch, Thiocyanates.

he ratio of oxygenation to the loading BOD sub hour is a better indication of purification in an idation ditch than the maintenance of a certain ssolved oxygen concentration at a certain posi-n in the ditch. Research analyzed in this way ows wide variation in the oxygen management of o different systems even when the dissolved ox-en levels are essentially the same. This difference in measurement can also cause considerable error in COD measurement and result in misleading and inaccurate information. (See also W71-07128) (Lowry-Texas)
W71-07131

FUNDAMENTAL PRINCIPLES OF SEWAGE CHLORINATION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
Chester E. Rhines.
Proceedings, Industrial Waste Conference, 21st, Mar 1966, Purdue University, Vol L, No 2, p 673-678. 4 tab, 3 ref.

Descriptors: *CHLORINATION, *Disinfection, Oxidation, Pathogenic bacteria, Sewage bacteria, Viruses, Coliforms, Aeration, Nitrites, Reduction (Chemical), Alkalinity, Biodegradation, Activated sludge, Waste water treatment.
Identifiers: Contact time, Clarification, Most probable number.

Chlorination has long been accepted for the disinfection of drinking water. Attempts at applying chlorination to raw sewage, however, have met with little or no success. Chlorine disinfection requires three conditions for efficient disinfection: (1) the chlorine must come in contact with the organism; (2) although disinfection will proceed in alkaline conditions, it does so at a much reduced rate, whereas in an acidic environment it is extremely active; and (3) lower temperature reaction conditions must be compensated for by increased contact time. The major hindrances to efficient disinfection can be removed through proper bio-oxidation and the clarification made possible for good bio-oxidation processes. Conversion of nitrogenous compounds to the nitrate form, and removal of large or clumped parasites, in addition to elimination of reducing substances and oxidation of toxic substances are all objectives accomplished by efficient bio-oxidation. From the above analysis, it is obvious that the failure of chlorine to provide adequate disinfection is largely a result of either inefficient or superficial bio-oxidation which can actually produce intermediate oxidation products which are detrimental to the disinfection process, such as nitrite nitrogen. (Lowry-Texas)
W71-07132

THE BIOCHEMISTRY OF ANAEROBIC DIGESTION,
Manhattan College, Bronx, New York. Civil Engineering Department.
John S. Jeris, Richard Schneeman, Cheng-nan Weng, Robert Gasser, and Yi-siung Su.
Available from the National Technical Information Service as PB-198 655, $3.00 in paper copy, $0.95 in microfiche. Final Report, 1970. 140 p, 23 fig, 9 tab, 45 ref, 6 append. EPA-WQO Research Grant 17070 DFK.

Descriptors: *Anaerobic digestion, *Methane bacteria, *Sludge digestion, Biodegradation, Sludge disposal, Waste water treatment, *Tracers, Radioactivity techniques, *Acids, Organic acids, *Digestion.
Identifiers: Acid degradation, Lactic acid, Propionic acid, Succinic acid.

This investigation sought to determine biochemical mechanisms in the anaerobic degradation of typical organics found in wastes by means of radioactive tracer techniques. Two liter laboratory scale digesters were used in all the radioactive tracer work. Substrate and nutrients were slug fed daily while carbon-14 compounds were slug fed one time or daily depending on the type of study being performed. Chemical analyses of the liquid feed and effluent were routinely performed along with identification of gaseous end products. Radioactivity analyses on the gases produced were conducted using liquid scintillation techniques. The degradation of propionic, succinic and lactic acids appear to be closely related with common intermediates. Propionic acid can be degraded through lactic or succinic acids and the reverse is true for each of the other two compounds. Propionic acid may also be metabolized by alpha or beta-oxidation giving rise to an intact methyl group in the methane formed, from either the number two or three carbon. A pathway for glutamic acid utilization was postulated involving the formation of two moles of acetic acid for each mole of substrate used. Oleic acid was primarily degraded by beta-oxidation. In the fermentation of benzoic acid, three moles of acetic acid were produced per mole degraded and the number one carbon was primarily converted to methane. (Bunch-EPA-WQO)
W71-07136

THE ECONOMIC FEASIBILITY OF ESTABLISHING AN IRRIGATED FORESTRY ENTERPRISE ON THE HANFORD RESERVATION, WASHINGTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
Bruce W. Cone.
Research Report YR 9341, Nov 1970. 43 p, 1 fig, 10 tab, 68 ref.

Descriptors: *Resource development, *Fiber crops, *Economic feasibility, *Forestry management, *Trees, Probability, Harvesting, Pulp and paper industry, Return (Monetary), Washington, Access routes, Nuclear reactors, Water supply, Irrigation water, Deserts, Arid lands, Humidity, Air temperature, Ornamentals, Plant growth, Crop production, Softwood, Lumber, Saw mills, Irrigable land, Economic prediction, Consumptive use, Water reuse.
Identifiers: Hanford Reservation (Washington), Calculated risk, Atmospheric factors.

Water discharged from reactors and processing plants, temperate climate, and controlled access may provide the residues to sustain a forest on the Hanford Reservation, Washington. The reservation is in a desert, where the relative humidity falls to 6%, and the temperature rises to 115 degrees. Some tree species survive in a few isolated areas as the remains of an older irrigated agriculture. To determine the economic feasibility of irrigating trees, available land, water and atmospheric factors are initially assessed. Estimates are made on the quantity of wood fiber which could be produced with a given water quantity. Finally, net returns on the most promising irrigated species (Ponderosa pine, Douglas fir, Poplar and Sycamore) are evaluated. Irrigated ornamentals also show considerable growth. The analysis concludes that it is economically feasible to establish an irrigated cottonwood or sycamore forest, providing the trees are mechanically harvested every 5 years, and the chips are used in an adjacent pulp mill. Net annual returns from cottonwood and sycamore are estimated at $23.52 and $45.54 per acre. Forest establishment under these circumatances is a calculated risk, where there is an 88% probability that present value of the cottonwood enterprise would be greater than O, and an 85% probability that it would exceed O from a sycamore enterprise. (Popkin-Arizona)
W71-07152

WATER-SEWER AND DRAINAGE PLAN FOR FORT SMITH URBANIZING AREA-PHASE II.
Arkhoma Regional Planning Commission, Fort Smith, Arkansas.

Available from the National Technical Information Service as PB-195 690, $3.00 in paper copy, $0.95 in microfiche. Arkhoma Regional Planning Commission, Fort Smith, Arkansas, June 1970. Volume II, 232 p, 7 fig, 6 tab. HUD Project No Ark P-105.

Descriptors: *Sewers, *Sewage treatment, *Drainage systems, *Urbanization, *Planning, Waste water, Waste water treatment, Water quality control, Sewerage, Municipal wastes, Water pollution, Sewage lagoons, Oxidation ponds, Sanitary engineering, Financing, Capital costs, Arkansas, Oklahoma.

Identifiers: *Regional sewer systems, *Fort Smith, Arkansas River.

A unified sanitary sewer system is recommended to serve the urbanizing area of Fort Smith which includes communities in both Arkansas and Oklahoma. Of the ten communities in this area, only Fort Smith, Van Buren and Alma have public sewer systems and public sewage treatment facilities. The others which range in population from 200 to 2,000 persons are served through individual septic tanks. It is estimated that the population will increase from the present 97,150 to 198,000 by 1990. Large distances between growth centers and a diversity of drainage areas impede the development of a unified areawide sewerage system and central disposal facilities. Sewage lift stations will be required to conduct flows to the Arkansas River to avoid constructing lengthy sewer lines. The river separates the urbanizing area into two parts. This dictates that two systems of interceptor sewers should be built paralleling the stream. It is recommended that two activated sludge sewage treatment plants be built downstream from the urbanizing area, one on each side of the river. Areawide requirements to facilitate connecting even the smallest residential developments to interceptor sewers when feasible are recommended. Interim sewage treatment facilities involving stabilization ponds or package plants are suggested until connections can be made to future interceptor sewers. Design criteria, capacity requirements, construction and operating costs, user charges, legislative needs, financing, cost sharing, existing system deficiencies, recommended improvements, and storm drainage needs are discussed. (Poertner)
W71-07191

A STUDY OF LOCAL NEEDS FOR WATER POLLUTION CONTROL FACILITIES IN FISCAL YEARS 1971-76.
National League of Cities, Washington, D.C.; and United States Conference of Mayors, Washington, D.C.

Reprinted in Congressional Record (Senate), Feb 10, 1971, p S1266--S1273. Feb 1971. 9 p, 2 tab.

Descriptors: *Water pollution control, *Waste water disposal, *Waste water treatment, *Drainage water, *Treatment facilities, *Investment, Urbanization, Cities, Municipal wastes, Estimated costs, Sewers.
Identifiers: *Capital requirements, Nationwide survey.

An extensive nationwide survey was made in 1970 of the capital requirements for constructing and improving local water pollution control facilities during the next six years. This information was requested of the National League of Cities and the United States Conference of Mayors by Senator Muskie of the Senate Public Works Committee. The survey covered 1,105 cities, counties and independent sewage treatment agencies serving a combined population of approximately 95 million persons. These communities identified needs of $21.7 billion. The survey also estimated that, based on a 5-percent inflation factor and the fact that 45 to 55 million of those persons served by sewers were not covered by the survey, total needs for public expenditures for clean water facilities during the next few years are in the range of $33 to $37 billion. The needs were separated into three categories in the mailed survey questionnaire. The needs reported were as follows: (1) primary and secondary treatment facilities, $9,311,987,574; (2) tertiary treatment facilities, $4,100,386,533; (3) interceptor and storm sewer improvements, $8,368,738,149. A significant portion of the needs reported were for interceptor sewers which are currently eligible for federal aid. Two tables are included which list the capital needs in each of the three categories. One table is a listing by states, and other a listing by individual jurisdictions within states. (Poertner)
W71-07192

THE SOUTH LAKE TAHOE WATER RECLAMATION PROJECT,
Hill (Clair A.) and Associates, Redding, Calif.
Harlan E. Moyer.
Public Works, Vol 99, Dec 1968, p 87-94. 7 fig, 1 tab.

Descriptors: *Water reuse, *Tertiary treatment, *Waste water treatment, *Waste water disposal, *California, Water utilization, Irrigation programs, Irrigation water, Pipelines, Pumping plants, Sewage treatment, Water pollution control, Water pollution treatment, Pumping, Water quality, Lake basins, Eutrophication, Financing, Sanitary engineering, Hydraulic engineering, Engineering structures.
Identifiers: *Lake Tahoe, *Indian Creek Reservoir, South Lake Tahoe, South Tahoe Public Utility District.

The planning, design, construction, financing and operation are described of a 28 million dollar water reclamation complex at the south shore of Lake Tahoe. The Lake Tahoe basin covers an area of 506 square miles, 192 of which comprise the Lake. The basin lies in California and Nevada and spreads through five counties and 65 local, state and federal agencies. A 2 1/2 mgd tertiary treatment plant was completed in 1965 to treat the effluent from the existing activated sludge plant. The primary, secondary and tertiary facilities were enlarged to 7 1/2 mgd by 1968. The process utilizes chemical coagulation, filtration through multimedia filters, ammonia stripping for nitrogen removal, and adsorbtion on activated carbon columns. Effluent, formerly used in spray irrigation of land in the basin, is now pumped through a 27 mile long pipeline constructed from the treatment plant at South Lake Tahoe to Indian Creek Reservoir. The reservoir was constructed to accept all of the effluent from the South Tahoe tertiary plant. It can store 3,225 acre-feet of reclaimed water which is used for irrigation purposes in Alpine County, California. The effluent is essentially of drinking-water quality. The reason for exporting the effluent from the Lake Tahoe Basin is to prevent any possible enrichment of Lake Tahoe waters by effluent nutrients. The plant is said to be the most advanced water reclamation facility in the world. (Poertner)
W71-07193

WATER AND SEWER PLAN AND PROGRAM, 1970.
Metropolitan Washington Council of Governments, D.C.

Available from National Technical Information Service, as PB-196 637, $3.00 in paper copy, $0.95 in microfiche. Sept 1970. 126 p, 14 fig, 9 tab, 88 ref. HUD Project No D C P-12.

Descriptors: *Water supply, *Water quality control, *Waste water treatment, *Water conveyance, *Planning, District of Columbia, Virginia, Mayland, Water resources, Water resources development, Urbanization, Cities, Water demand.
Identifiers: *Potomac River, *Metropolitan Washington, Water and sewer plan, Metropolitan planning.

This report updates an earlier report, 'Water and Sewerage Facilities Planning and Programming for the Washington Metropolitan Area' prepared in 1969. It identified the existing problems and concerns; documents the progress made recently; and discusses the existing national, state and regional goals, objectives and policies regarding water and sewer facilities. A regional water and sewer plan and a short range program for the 1970-76 period are outlined. Future water and sewer policies for the region are also recommended. Growing concern is cited over the water quality of the Potomac River and Estuary along and with the need for interrelated metropolitan and basinwide planning. Critical overflows in certain sewer systems and the need for providing, expanding and implementing waste water treatment plants are some of the other concerns identified in this report. The most critical need of sewage treatment in the metropolitan area is the immediate upgrading of the Blue Plains Water Pollution Control Plant. The most vital problem of regional water supply is the low flow in both the Potomac and Patuxent Rivers during summer months. Construction of additional upstream reservoirs on the Potomac River is a critical need. One of the major concerns in water distribution within the metropolitan area is the increasing complexity of water management brought about by the demand for expansion of distribution facilities. The Potomac River is considered the best source of water supply; however, recommendations are made to explore alternate sources including water water reclamation. The water demand is expected to increase from 380 mgd in 1970 to 1,050 mgd in the 1990's. (Poertner)
W71-07202

ENVIRONMENTAL FINANCING ACT OF 1971 (A BILL TO ESTABLISH AN ENVIRONMENTAL FINANCING AUTHORITY TO ASSIST IN THE FINANCING OF WASTE TREATMENT FACILITIES).
For primary bibliographic entry see Field 06E.
W71-07222

TEMPERATURE EFFECTS ON BIOLOGICAL WASTE TREATMENT PROCESSES,
Vanderbilt Univ., Nashville, Tenn.
W. Wesley Eckenfelder, Jr., and A. J. Englande.
Waste Water Conference, University of Alaska, June 1970.

Descriptors: *Temperature, *Waste water treatment, *Aerobic treatment, *Activated sludge, Lagoons, Dissolved oxygen, *Biological treatment, Biomass, Biochemical oxygen demand, Microorganisms, Bacteria, Sewage bacteria, Thermophilic bacteria, Water pollution, Thermal pollution, *Oxidation lagoons.
Identifiers: Temperature effects.

The temperature effect on the biological processes taking place in waste stabilization ponds, activated sludge tanks and aerated lagoons is discussed. The comparison uses a modification of the Van't Hoff-Arrhenius equation from which the thermal coefficient, theta, is calculated. It was found that temperature effects are minimal on activated sludge process performance as compared to other treatment systems. The low sensitivity of the activated sludge process is primarily due to the low F/M ratio which results in biological growth. Waste stabilization pond, aerated aerobic-facultative lagoon, and anaerobic pond processes operate at a lower solids level and/or a higher F/M ratio. Because of the dispersion of the biomass within these systems, the process is more directly affected by variation in temperature. (Novotny-Vanderbilt)
W71-07321

EVALUATION OF ADVANCED TREATMENT PROCESSES FOR IMPROVING PLANT PERFORMANCE,
North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering; and North Carolina Univ., Chapel Hill. Sanitary Engineering and Water Resources Program.
James C. Lamb, III.
Waste water Research Center Report No 12, 1970. 9 p, 6 ref.

Descriptors: *Evaluation, *Waste water treatment, *Water purification, *Design, *Technology, Biochemical oxygen demand, Nitrogen, Phosphorus, Biological treatment, Activated carbon, Distillation, Electrodialysis, Reverse osmosis, Potable water, Organic compounds, Inorganic compounds.

The gap between research pertinent to waste water treatment and technology applied in the field and design is discussed. Together with suggestions for enhancement and extension of existing processes attention is called to the recent overemphasis o

ıste water treatment and inadequate attention to ıter supply and treatment of municipal water. eatment employed in municipal practice does t reduce the concentration of 40 out of 50 im-ortant constituents. This is particularly true of emicals which contribute to the carbon-loroform extract and many pesticides. The use of tivated carbon and other new technology ethods could enhance the quality of the mu-cipal water supply. Recent suggestions are also entioned about the possibilities of obtaining a table water supply from relatively uncon-minated sources and establishing two or more ıter distribution systems in a municipality. Vilde-Wisconsin)
71-07352

ESIGN AND OPERATING EXPERIENCES SING DIFFUSED AERATION FOR SLUDGE GESTION,
lbert Associates, Inc., Reading, Pa. Environmen- Engineering Div.
wis E. Ritter.
ater Pollution Control Association of Pennsyl-nia, 41st Annual Conference Aerobic Digestion ndated) (1969). 17 p.

escriptors: *Sludge digestion, *Sewage treat-ent, *Design criteria, *Evaluation, *Operating sts, Separation techniques, Aerobic treatment, naerobic treatment, Activated sludge, Coagula-n, Flow control, Phosphates.
entifiers: Contact stabilization process, Sludge thdrawal parameters, Sack-type diffusers, Super-tant, Orthophosphate removal.

erobic sludge digestion was studied in three ants of eastern Pennsylvania. The process quires 3 to 5 cu ft digestion volume and 1 sq ft ying space per capita, and aeration rate of 20 cfm r 1000 cu ft of digester capacity. The digestion is e from obnoxious odors. Manual decanting of pernatant increases phosphate concentration in e effluent. Concentrating sludge prior to feeding creases destruction of volatile solids. Addition of ne as a drying aid and aluminum sulfate as a agulant increases drainability and reduces time, t leads to formation of crusts of chemicals on ying beds. (Wilde-Wisconsin)
71-07358

YDRAULIC AND REMOVAL EFFICIENCIES SEDIMENTATION BASINS,
isconsin Univ., Madison. Dept. of Civil Engineer-g.
R. Villemonte, G. A. Rholich, and A. T. Wallace.
oceedings, Third International Conference on ater Pollution Research, Munich, Germany, Vol p 381-395, 1966. 6 fig, 3 tab, 5 ref.

escriptors: *Sedimentation, *Gravity, *Flow-ts, Vertices, Eddies, Dispersion, Kinematics, otropy, Tracer, Turbulence, Dye releases, Floc-lation, Waste water treatment.
entifiers: Removal efficiencies, Hydraulic effi-ency, Short circuiting, Stagnant, Quiescent, Ec-ntricity.

dimentation basins were assumed to be presented by a system consisting of: (1) stagnant dead regions, (2) isotropic small-scale, moving dy systems, (3) macroscopic recirculation stems. Flourescent tracer studies supported this sumption, with the result that non-ideal sedimen-tion basins were characterized by their flow-net urves. Quiescent column studies were then per-rmed to determine critical settling velocity. ese studies established the settling depth as a eful criterion for determining basin performance, eration, and for making comparative analyses. his parameter can also be used as a measure of the fectiveness of an established system to treat a w waste, and the efficiency with which spended matter will be removed. All of the above vestigations aided in establishing a nearly linear rrelation between hydraulic efficiency as presented by the hydraulic characteristic criteria, and removal efficiency. (See also W71-07363 thru W71-07365) (Lowry-Texas)
W71-07362

DISCUSSION OF 'HYDRAULIC AND REMOVAL EFFICIENCIES IN SEDIMENTATION BASINS,'
Birmingham Univ. (England).
M. J. Hamlin.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 404-408, 1966. 4 fig, 6 ref.

Descriptors: *Settling basins, *Sedimentation, *Density currents, Flocculation, Turbulence, Tracer, Suspensions, Efficiencies, Sampling, Baffles, Weirs, Waste water treatment.
Identifiers: *Flow-through curves, Model tanks, Suspended solids, Quiescent.

The mechanics of sedimentation basins have never been fully understood because of their complexity and the number of variables they contain which cannot be duplicated. Even in model tanks, simplifying restrictions must be made to enable any progress to be made. Density currents are present in sedimentation tanks and current research yielded the following results: (1) density current velocity is independent on flow rate; (2) effluent quality does not deteriorate significantly with increasing flow within the limits of flow of the experiment; (3) no conclusive evidence has been obtained as to the relative efficiencies of narrow tanks versus wide tanks; and finally, the most consistent results were obtained using a drowned weir. Much work remains to be done on isolation techniques needed for future experiments. (See also W71-07362) (Lowry-Texas)
W71-07363

FORMAL DISCUSSION OF 'HYDRAULIC AND REMOVAL EFFICIENCIES IN SEDIMENTATION BASINS',
Alexandria Univ. (Egypt).
Hassan El-Baroudi.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 395-399, 1966. 2 fig, 6 ref.

Descriptors: *Settling velocity, Efficiencies, Turbulence, Tracer, Dispersion, Flocculation, Sedimentation, Waste water treatment.
Identifiers: Hydraulic properties, *Geometric configuration, *Critical settling depth, Critical settling time, Ideal mixing, Detention time.

The problem of relating particle removal to hydraulic and geometric properties of a settling tank has not yet been solved. Critical settling depth for each geometric configuration must be determined by trial and error. Predicted and actual removal efficiencies have been in good agreement for certain geometric configurations, but universal application to all configurations and different floc types is impossible. Critical settling time, can replace the critical settling depth as follows: (1) plot total removal versus settling time in a quiescent tube, and average removal will take place at the critical settling time, T sub c, if there is one; (2) compute ideal removal from theoretical detention time T sub 1; (3) from the removal versus settling time plot, find the critical removal R sub c corresponding to T sub c; (4) take the ratio of T sub c to T sub 1 to be the criterion of tank performance, zero for mixing tanks and 1.0 for ideal tanks. Using this information in conjunction with the tracer dispersion curves formulated by Villemonte, Rohlich, and Wallace, the idea of deducing T sub c from dispersion curves can be accurately tested. (See also W71-07362) (Lowry-Texas)
W71-07364

DISCUSSION OF 'HYDRAULIC AND REMOVAL EFFICIENCIES IN SEDIMENTATION BASINS',
Johannesburg (South Africa).
E. J. Hall.
Proceedings, Third International Conference on Water Pollution Research, Vol 2, Munich, Germany, p 399-403, 1966. 4 fig, 5 ref.

Descriptors: *Mixing, *Flocculation, Suspension, Efficiencies, Settling velocity, Temperature, Flow-net, Dispersion, Waste water treatment.
Identifiers: Hydraulic characteristics, Critical settling depth.

Critical settling depth ratio has application, at best, to specific temperature and suspended solids concentration. Even in this restricted range, previous work has demonstrated that while a broad general pattern may be reproduced, a given specific flow pattern in either a rectangular or circular basin cannot be faithfully reproduced. Further, when a suitable set of settling curves cannot be obtained, the method cannot be applied at all. Results of studies made in the field have shown solids removals far in excess of the theoretically predicted maximum. This phenomenon has been attributed to the flocculent characteristics of settling sewage. These results do not support the contention that column settling curves typify the settling characteristics of a particular basin. Ideal flow in a basin, for maximum solids removal does not conform to a classical idea of non-dispersed plug flow, since control of turbulence can aid flocculation and thereby enhance removal. In summation, the concept of critical settling depth can have no real meaning in the case of sewage settlement, largely because settled sewage exhibits the property of auto flocculation, and the rate of flocculation is dependent on the character and degree of mechanical mixing applied. (See also W71-07362) (Lowry-Texas)
W71-07365

PHOTO-FILM INDUSTRY WASTES: POLLUTION EFFECTS AND ABATEMENT,
Central Public Health Engineering Research Inst., Nagpur (India).
G. J. Mohanrao, K. P. Krishnamoorthi, and W. M. Deshpande.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 1, p 181-198, 1966. 4 fig, 12 tab, 9 ref.

Descriptors: *Ammonium compounds, *Toxicity, *Chemical precipitation, Chemical wastes, Bioassay, Acclimatization, Chemical oxygen demand, Biochemical oxygen demand, Color, Hydrogen ion concentration, Dissolved oxygen, Activated sludge, Waste water treatment.
Identifiers: Photo-film industry wastes, Laboratory effluent, TL sub m (test concentration at which fish mortality was 50%), White water, Emulsion washwater, Hydroquinone, Metol, Synergistic, Antagonistic, Alum coagulation, South India.

Tests indicated that the effluent from a proposed photo-film manufacturing plant would be toxic to fish in the receiving waters. The effluent was composed of waste waters from three different sources. In order of descending toxicity, these are the laboratory effluent, the emulsion washwater, and the white water. The TL sub m values for these effluents are 1, 5, and 10% by volume respectively. A mixture of these wastes, composited in the relative amounts in which they would be manufactured, had a TL sub m value of 5%. The wastes were toxic to biological treatment of the conventional type, but, it was found that a biological system could become acclimated to the wastes after the wastes had been treated with a coagulant. The effluent obtained after treatment of the composite sludge with 500 mg/l of alum could be handled further on an activated sludge plant after mixing with the available domestic sewage (5:3, photowaste;sewage) producing an innocuous effluent at low BOD and COD. (Lowry-exas)
W71-07366

DEGRADABLE POLLUTANTS-A STUDY OF THE NEW DETERGENTS,
California University, Berkeley. Sanitary Engineering Research Lab.
P. H. McGauhey, and Stephen A. Klein.

Proceedings of the Third International Conference, Munich Germany, Vol 1, p 353-364, 1966. 4 fig, 4 tab, 8 ref.

Descriptors: *Alkyl benzene sulfonates, *Linear alkylate sulfonate, Aesthetics, Frothing, Colorimetry, Tracers, Biodegradation, *Detergents, Biological treatment, Waste water treatment.
Identifiers: *Alcohol sulfate, *Radioassay, Foamability, Pilot experiments, Livermore, California, Sewage Treatment facility of the Sanitary Engineering Research Laboratory, California, University.

Alkyl benzene sulfonates have been loudly denounced by the American public on account of their tendency to cause foaming problems in receiving streams which are aesthetically unpleasing. Linear alkylate sulfonate has now been substituted by the detergent industry as their new synthetic surfactant, and these tests were conducted to determine whether or not additional treatment facilities will be required. The results or monitoring studies of two treatment plants during the ABS to LAS change over specifically indicate that the change over will not reduce the necessity for a high degree of treatment. Where such a high degree of treatment exists, and the effluent is diluted to a large extent, no further foaming problems should be encountered. In instances where there is little or no dilution of the waste, and/or there is no secondary treatment, then improved facilities must be constructed to adequately handle the problem. In most instances, however, sewage treatment adequate to meet the aesthetic and other objectives of water quality control, the detergent fraction of the waste will be removed satisfactorily without special treatment processes. (Lowry-Texas)
W71-07367

NEW SEWAGE DISPOSAL SYSTEM AT TAHOE CITY.
For primary bibliographic entry see Field 05E.
W71-07368

WASTE TREATMENT AT THE RATH PACKING COMPANY,
Rath Packing Co., Waterloo, Iowa.
M. J. Andera, G. R. Foss, and H. A. Brandeland.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 52-55, Mar 1966.

Descriptors: *Waste water treatment, *Industrial wastes, Municipal wastes, Sewage, Water use, Biochemical oxygen demand, Iowa.
Identifiers: *Meat packing wastes, Waterloo (Ia).

The waste water control program of the Rath Packing Company has mainly been one of education and elimination. All of the waste effluent from the plant, with the exception of sanitary wastes, is pre-treated in settling basins for removal of grease and sludge before being sent to the municipal waste water treatment plant. The main emphasis of the control program has been reduction of total waste flows through careful monitoring of waste streams and total water usage. Foremen in each of the areas were instructed, first as to how much water they were actually using, and secondly, how to eliminate or reduce water requirements for washing etc. As a result, some waste streams were segregated, leaving others clean enough to be utilized again as washwater, significantly reducing water usage. With a daily flow of 4.5 MGD, 500 to 1,000 lbs of grease are lost per day, but recovery above this level is unfeasible economically. However, the measurement of this and other pertinent parameters demonstrates the need for a well-equipped laboratory for efficiency evaluations and other development work. The key, both to laboratory and plant efficiency in pollution control, however, is education of key personnel to the responsibilities of waste water control, and the expensive consequences of neglect. (Lowry-Texas)
W71-07369

GENERAL MOTORS APPROACH TO WATER POLLUTION CONTROL,
General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Field 05G.
W71-07370

THE ROLE OF ENZYMES IN THE CONTACT STABILIZATION PROCESS,
Illinois Univ., Urbana.
Rashid H. Siddiqi, R. S. Engelbrecht, and R. E. Speece.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 353-380, 1966. 8 fig, 13 ref.

Descriptors: *Activated sludge, *Kinetics, *Stabilization, *Enzymes, Synthesis, Respiration, Metabolism, Storage, Catalyst, Acclimatization, Infiltration, Hydrolysis, Adsorption, Organic loading, *Waste water treatment.
Identifiers: *Contact stabilization, *Inducible, *Constitutive, *Permease, Food to microorganism ratio, Overoxidation, Endogenous metabolism, Substrate, Activity, Langmuir adsorption isotherm.

Previous research has stated that the rate of uptake is directly proportional to substrate concentration. However, it was demonstrated in this research that exogenous soluble organic matter is transported by enzymes into the bacterial cell, and that this rate of removal can be saturated by increasing the food to microorganism ratio. Therefore, utilization of a complex waste, containing both suspended and dissolved organic matter, for studying the mechanism and kinetics of initial uptake of soluble organic matter produces erroneous results. Initial increases in removal capacity can now be attributed to the production of synthesis and respiration enzyme systems. In the same manner, decreases in removals are accounted for by the inactivation of the enzyme systems. A thorough account of the mechanisms of the enzyme systems is presented here. From this and further work, it is hoped that design and operation of contact stabilization waste water treatment processes can be more clearly defined in the interest of greater economy and efficiency. (See also W71-07372 and W71-07373) (Lowry-Texas)
W71-07371

DISCUSSION OF 'THE ROLE OF ENZYMES IN THE CONTACT STABILIZATION PROCESS',
Texas Univ., Austin.
Davis L. Ford, and W. Wesley Eckenfelder, Jr.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 368-371, 1966. 4 fig, 7 ref.

Descriptors: *Kinetics, *Metabolism, Adsorption, Stabilization, Oxidation, Colloids, Activated sludge, *Waste water treatment.
Identifiers: *Contact stabilization, Uptake site saturation, Over-oxidation, *Inactivation, Dehydrogenase, Activity, Enmeshment, Substrate, Endogenous respiration, Brewery waste.

'Uptake site saturation' is the limiting factor in biological metabolism, rather than substrate concentration. This phenomenon is known as permease saturation. Above a certain F/m ratio, biological systems are independent of substrate concentration. Uptake mechanisms and kinetics can best be observed through the use of pure culture, although the same general conclusions can be drawn from data obtained from a complex filtered waste. Basic initial uptake concepts persist, but rates and characteristics of the mechanics change from waste to waste and laboratory investigations of individual wastes must be performed. (See also W71-07371) (Lowry-Texas)
W71-07372

DISCUSSION OF 'THE ROLE OF ENZYMES IN THE CONTACT STABILIZATION PROCESS',
Stanford Univ., Calif.
Perry L. McCarty.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 372-376, 1966. 2 fig, 1 tab, 1 ref.

Descriptors: *Enzymes, *Biodegradation, Microorganisms, Bacteria, Metabolism, Adsorption, Toxicity, Infiltration, Flocculation, Activated sludge, *Waste water treatment.
Identifiers: *Contact stabilization, Contact time, Piston flow, Plug flow.

Some of the advantages of the contact stabilization process are that it requires a smaller aeration tank volume, and the stabilizing sludge offers a reserve to be drawn upon in the case of toxic wastes. However, several disadvantages are also inherent to this system. The most important of these is the phenomenon of inducible enzyme inhibition. Loss of the inducible enzymes stops biological activity. These new facts about the operations of contact stabilization versus completely mixed activated sludge necessitate a thorough study of the nature of the waste to be treated before an intelligent judgement can be made. (See also W71-07371) (Lowry-Texas)
W71-07373

FLUID-CARBON COLUMNS FOR SORPTION OF RESISTENT ORGANIC POLLUTANTS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
Walter J. Weber, Jr.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 1, p 253-276, 1966. 10 fig, 3 tab, 17 ref.

Descriptors: *Activated carbon, *Adsorption, *Saturation, Competition, Heterogeneity, Fouling, Temperature, Hydrogen ion concentration, Waste water treatment.
Identifiers: *Fluid-carbon column, *Packed carbon column, Binding, Capacity, Particulate, Concentration, Transport mechanism, Breakthrough, Acidification, Ultraviolet adsorption, Langmuir adsorption isotherm.

Fluid-carbon contact chambers showed no increased head loss after 16 days, whereas the packed carbon column of 1.83 meter depth was clogged completely within a few hours. Packed carbon columns have a tendency for the carbon particles to adhere to each other, thus clogging the column. Factors influencing performance of fluid carbon contactors are: (1) molecular weight of adsorbate, when two or more are mixed, (2) competition for adsorption between the components of heterogeneous solution, and (3) pH may sometimes enhance removal is adjusted to an optimum level, although this is not always a significant factor. Fluid-carbon columns were demonstrated to have very high adsorption capacities. Packed carbon columns may adsorb 15-20% by weight when adsorbing coarse particles, whereas fluid-carbon columns have attained capacities of up to 40% by weight in heterogenous solutions. (Lowry-Texas)
W71-07374

TREATMENT OF ANIMAL WASTES AT THE GREENFIELD LABORATORIES OF ELI LILLY AND COMPANY,
Eli Lilly and Co., Greenfield, Ind.
Thomas W. Bloodgood.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 56-61, May 1966. 1 tab, 1 ref.

Descriptors: *Waste water treatment, *Animal wastes, *Farm wastes, Lagoon, Aeration, *Indiana, Trickling filter, Laboratories, Baffles, Biochemical oxygen demand, Toxicity.
Identifiers: Laboratory wastes, Toxicology, Clarifier, Imhoff tank, Greenfield (Ind), Eli Lilly and Company.

Since the initial installation of Eli Lilly and Company's plant at Greenfield, Indiana, $405,000 have been spent on 5 separate waste treatment facilities mainly for the wastes of the laboratory animals used for testing and culturing of serums and antitoxins. Plant 238 consists of a baffled lagoon, half aerated and half quiescent. A 275 cfm blower is used to aerate the wastes of approximately 240 ca

and 250 sheep. There is much loss due to page, and little surface effluent. Influent BOD 5 of approximately 225 mg/l is reduced to approximately 75 mg/l. Plants 237, 236, and 226 all ploy modifications of the activated sludge cess. Solids are screened from the influent and posed of by a firm under contract with Lilly and mpany for that purpose. Flows entering these nts originate from chickens, swine, and small oratory animals such as rabbits, monkeys, nea pigs, hamsters, mice, dogs, cats, and rats. Int BOD's range from 100 to 510 mg/l, and efnts average 75 mg/l. Plant 219 is a primary tment plant consisting of primary clarification, rge tank clarifier and an Imhoff tank used as a ester. A 22 ft diameter high rate trickling filter a final clarifier provide secondary treatment. influent averages 80,000 gpd with a BOD of mg/l. Effluent BOD averages 35 mg/l. These nts are operated by two men, one a Class D rator. Total operating costs are approximately ,000 per year, excluding utilities. (Lowry-Tex-

1-07375

STE DISPOSAL AT THE DANA CORPORAON PLANT, TOLEDO, OHIO,
a Corp., Toledo, Ohio.
. Page.
ceedings, Industrial Waste Conference, 21st, due University, Vol L, No 2, p 33-34, Mar 6.

scriptors: *Oily water, *Chemical wastes, paration techniques, Coolants, Oils, Oil wastes, ulsions, Flocculation, Neutralization, Weirs, drogen ion concentration, *Ohio, Waste water tment.
ntifiers: Metal machining, Chips, Clarifier, cdo (Ohio), Dana Corp.

ustrial wastes produced from metal machining rations at the Toledo, Ohio plant of the Dana rporation include soluble oil, synthetic machin- coolants, metal cleaning compounds, plating other chemical materials, and washer inings. Prior treatment facilities included a cen- collection header, from which all waste streams re pumped to a 2.5 million gallon reservoir and wed to separate by gravity. Increased flows and her levels of toxic waste materials necessitated dating of the treatment facilities. A three stage tment facility was designed. A 75,000 gallon alization tank is used to permit gravitational aration of 'free' oils and chemical equalization various agents. The wastes then pass through an ustable weir box which provides a constant outv. At the V-notch outfall of this weir box, floc- ation chemicals are added to take advantage of ing through turbulence. The wastes then flow a clarifier, and the pH is decreased sufficiently produce degradation of solubilizing agents, and mical neutralization of soaps and other emulers. In tank B, small additions of lime are made enhance flocculation, ferric sulfate is added to duce an acid attack on residual synthetic emulers, and Purifloc 'A' is added as a flocculent aid. the C-tank, or accelerator, lime adjustment of brings the pH to 8.0, an ideal point for release. blems encountered are attributed mainly to al chips which clog lines and cause increased mp wear. Methods of removal of such chips are ng studied, but, at present, two 25,000 gal. rage tanks are used for holding basins during akdowns. (Lowry-Texas)
1-07376

COVERY OF EDIBLE AND INDUSTRIAL ODUCTS FROM EFFLUENT STREAMS OF TATO PROCESSING PLANTS,
d River Valley Potato Processing Lab., East and Forks, Minn.
Shaw.
ceedings, Industrial Waste Conference, 21st, y 3, 4, 5, 1966, Purdue University, Vol L, No 2, rch 1966, p 13-18. 1 tab, 11 ref.

Descriptors: *Potatoes, Distillation, Microbiology, Economics, Foods, Alcohol, Effluent, *Water reuse, *Waste water treatment.
Identifiers: *Potato wastes, Starch, Edible products, *Poland.

The ever increasing volumes of waste materials, and the subsequently increasing cost of waste water treatment has caused much interest in recovery and profitable use of potato processing by-products which were formerly discharged directly to waste streams. The candidate process of greatest promise is the vertical integration of the potato industry. The potato industries of Poland and the USSR are presented as examples. In Poland, potatoes are used for four main purposes: alcohol, starch, food products, and animal feed. All by-products, except those of starch, are completely utilized. Recent developments in uses of potatoes in combined alcohol and starch plants have ennabled Russian industries to utilize a total of 95.5% of the total raw potato input. In Eastern Europe, where protein nitrogen and vitamins are in short supply, potato mash provided an excellent culture medium, thereby lessening disposal problems and increasing profit per unit. Methods and procedures followed in Eastern Europe may be at least partially applicable to potato processors in the United States. Vertical integration of the potato industry to include horticulture, distillation, and microbiology, along with increased marketing technology may well aid in the development of even better potato products with significant savings both in processing and treatment. (Lowry-Texas)
W71-07377

THE EFFECT OF INLET CONDITIONS ON OIL-WATER SEPARATORS AT SOHIO'S TOLEDO REFINERY,
Clemson Univ., S.C. Dept. of Civil Engineering.
A. T. Wallace, G. A. Rohlich, and J. R. Villemonte.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 618-625, March 1966. 8 fig, 1 tab, 2 ref.

Descriptors: *Oily water, *Separation techniques, *Dispersion, Orifices, Baffles, Jets, Weirs, Diffusion, Mixing, Oil, *Oil wastes, *Ohio, Waste water treatment, Oil-water interfaces.
Identifiers: *Oil-water separators, Inlets, Sohio, Toledo (Ohio).

Dispersion curves were obtained for two experimental basins differing only in inlet design. Oil removals, obtained by the two basins were measured at comparable flow rates. To obtain the dispersion curves, adjustable inlet gates were set at the appropriate gauge reading and the basin was allowed to operate for one full detention time to stabilize. Dye tracers were injected, and the basins were compared at separator overflow rates of 500, 1000, 2000, and 4000 gallons sq ft/day. From the previously described dispersion and oil removal tests, the reaction jet baffle inlet was again proved superior to the simple overflow inlet weir. However, because of the brief duration of the testing program, it would be desirable to obtain more comparative oil removal data from the two separators. Actual separator behaviour was demonstrated to be far short of ideal behaviour and increasing flow rates caused an even greater discrepancy. An increase of the overflow rate from 500 to 4000 gal/ft/day decreased the efficiency of the reaction jet baffle from .81 to .59, and that of a simple inlet weir from .675 to .235. (Lowry-Texas)
W71-07378

AN INVESTIGATION OF THE EFFECTS OF RESIDENCE TIME ON ANAEROBIC BACTERIAL DENITRIFICATION,
California Univ., Davis.
Stephen F. Moore, and Edward W. Schroeder.
Water Research, Journal of the International Association on Water Pollution Research, Vol 4, No 10, p 685-694, October 1970. 8 fig, 2 tab, 19 ref.

Descriptors: *Denitrification, *Anaerobic conditions, Nitrogen, Phosphorous, Microorganisms, Physiology (Animal), Cost analysis, Hydrogen ion concentration, Waste water treatment, *Anaerobic bacteria.
Identifiers: *Residence time, Washout, Complete mixing, Methanol, Batch studies.

A bench scale laboratory apparatus was utilized in the study of the effect of residence time on cell yield and reaction rates in anaerobic bacterial denitrification. The contents of the reactor were assumed to be completely mixed, to be at or near steady state, and to follow first order kinetics with respect to cell growth. Analysis of the data obtained from the reactor revealed that (1) complete mixing is essential for optimal removal of nitrate in bacterial denitrification ponds, and (2) batch studies do not adequately model a continuous flow system. Also, bacterial denitrification was greatly influenced by the bacteriology, largely a function of the rate and composition of the feed. At optimum hydraulic and organic conditions, then, there existed also an optimum residence time which was determined to be 6 days for the waste and the conditions in this particular study. Nitrate buildup, reported to be a problem in earlier work, was not observed to be a problem in a completely mixed, continuous flow reactor. (Lowry-Texas)
W71-07379

NEW APPROACH TO PHOSPHATE REMOVAL: FILTRATION THROUGH MAGNESIA,
Anne Arudel County, Dept. of Public Works, Glen Burnie, Md.
Guenter Spohr, and Andres Talts.
Public Works, Jan 1971, Vol 102, No 1, p 58-60. 3 fig, 3 tab, 5 ref.

Descriptors: *Phosphates, *Filtration, Magnesium compounds, Pilot plants, Absorption, Hydrogen ion concentration, Alkalinity, Turbidity, *Waste water treatment.
Identifiers: *Magnesium oxide, Laboratory scale, Breakthrough, Regeneration, Suspended solids.

Both laboratory and pilot scale columns were utilized to determine the efficiency of removal of phosphate when it was passed through packed columns of magnesium oxide. Two commercially available magnesium oxides were analyzed, having bulk densities varying between 55 and 125 lb per cu. ft. The magnesium oxide was placed in glass columns 2.1 cm in diameter and of varying lengths. The phosphate solution was passed through the column of 1 gpm/ft sq. Four regeneration techniques were also evaluated with respect to how well they restored original performance of new media. Removal efficiencies in excess of 90% were recorded in this experiment, in agreement with work done earlier. Further study is needed to determine the actual mechanism of removal of the phosphate from the solution. More work remains to be done concerning regeneration of magnesium oxide also. Distilled water wash plus burning restored the magnesium oxide to removal levels comparable to new media, but the process is rather costly. No cost estimates are available at this time, but this and other papers suggest that filtration through magnesium oxide may be a workable means of phosphate removal in the future. (Lowry-Texas)
W71-07380

STAINLESS STEEL IN WATER AND WASTE WATER TREATMENT,
American Iron and Steel Inst., New York. Committee of Steel Plate Producers.
E. S. Kopecki.
Public Works, Jan 1971, Vol 102, No 1, p 81-83. 2 ref.

Descriptors: *Stainless steel, *Corrosion, Maintenance, Strength, Durability, Flexibility, Stability, Weirs, *Waste water treatment.
Identifiers: Microstrainer, Tanks, Aeration systems, Buckling.

Increasing corrosiveness of influent raw waters and waste waters to treatment plants has necessitated the changeover of many items in waste treatment plants from ordinary steel or iron to stainless steel. Stainless steel, while not able to compete economically if substituted in the same thickness as rolled iron or steel, is of such greater durability and strength that it may be possible to use a thinner gage of stainless steel to do the same job. The new light gage design concept is now incorporating the use of stainless steel into the original designs rather than merely replacing existing fixture with new ones of stainless steel. Many new plants, and new additions to existing plants are utilizing stainless steel almost exclusively in areas where corrosion is a problem. As more stainless steel is used the unit cost becomes smaller, and the overall plant maintenance is also greatly decreased. (Lowry-Texas)
W71-07381

LIGHT INTENSITY AND THE VERTICAL DISTRIBUTION OF ALGAE IN TERTIARY OXIDATION PONDS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
William R. Hartley, and Charles M. Weiss.
Water Research, Vol 4, No 11, Nov 1970, p 751-763. 7 fig, 2 tab, 18 ref.

Descriptors: *Algae, *Oxidation lagoons, *Light intensity, Ponds, Rotifers, Protozoa, Photosynthesis, Chlorophyll, Temperature, Hydrogen ion concentration, Dissolved oxygen, Stratification, Sampling, Microorganisms, Sludge, Tertiary treatment, Biochemical oxygen demand, Waste water treatment, *North Carolina.
Identifiers: Durham (NC).

Five oxidation ponds at the Third Fork Treatment Plant in Durham, North Carolina, were investigated to determine the optimum lighting conditions, the types of organisms present in different situations, and their vertical distribution in the pond levels. Samples in the ponds were taken at 3,6,9,12,15,18,21,24 inches, and the sludge layer. These samples were taken every two hours over the 24 hour diurnal cycle. The samples were preserved in 3% formalin, and then taken to the laboratory for analysis. Light intensity, pH, dissolved oxygen, and temperature were also recorded at the time of sampling. The samples taken were counted for number of organisms present, and, also centrifuged for identification of species present in lesser numbers. The surface weirs installed in the ponds affect the chemical and physical parameters of pond performance with particular reference to the dissolved oxygen concentration, it being much lower in the pond which allowed the mat to form at the surface. Eugena Rostifera will change their vertical position in the pond to reach the point of submergence where the light intensity is 75 candles/ft2. Where they were not able to move to retreat from high light intensity cysts were formed. (Lowry-Texas)
W71-07382

THEORETICAL ANALYSIS OF ACTIVATED SLUDGE DYNAMICS,
Clarkson of Technology, Pottsdam, N.Y. Dept. of Civil Engineering.
Charles R. Ott, and Richard H. Bogan.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA1, p 1-17. 8 fig, 5 tab, 16 ref. National Science Foundation Grant No GK-180.

Descriptors: *Mathematical models, *Computer models, *Simulation analysis, *Activated sludge, Kinetics, Organic loading, Effluents, *Biochemical oxygen demand, Model studies Sludge, Waste water treatment.
Identifiers: Step functions, Transients, Hydraulic loading, Influent, Suspended solids.

A computer simulation of the complete mixed activated sludge process was formulated to determine the response of the process to time variant BOD loading and amount of sludge recycle. Mass balance equations were derived for all processes concerned with the activated sludge mechanisms and these equations were then put into the computer. Perturbations to the system were provided either as step functions or time varying inputs. The effluent BOD was then monitored to determine the effect of the various inputs to the system. From the above simulation, it was determined that the effluent BOD concentration is two orders of magnitude more sensitive to variations in influent flow rate and BOD concentration than to variations in the sludge recycle rate. Also, the biological response rate was found to be very slow, and in the absence of adequate reserves of activated sludge, sludge recycle is relatively ineffective in controlling response of the process to rapid fluctuations in input conditions. Therefore control of input flow rate and input BOD appear to provide the most effective means of process control, and BOD mass escapement can be most readily accomplished by minimizing flow fluctuations. (Lowry-Texas)
W71-07383

STUDY OF AEROBIC THERMOPHILIC PROCESSES FOR WASTE TREATMENT,
Clemson Univ., S.C. Environmental Systems Engineering Program.
C. R. Nichols.
Environmental Systems Engineering Report 66-1, June 1966. 102 p, 19 fig, 8 tab, 62 ref, append.

Descriptors: *Aerobic conditions, *Aeration, Oxygen, Mathematical model, Temperature, *Waste water treatment, Metabolism.
Identifiers: *Thermophilic conditions, *Mesophilic conditions.

An investigation was conducted to determine the substrate utilization rate, organism growth rate and yield, organism decay rate, and kinetic constants for organisms grown in continuous flow, completely mixed reactors with turbine aerators. The constants were found for identical reactors under identical conditions except for the temperature in the mesophilic reactor being 26C and 54C in the thermophilic reactor. The reactors were closed systems with provisions for monitoring of influent and effluent gas and liquid streams. The substrate consisted of 1800 mg/l of glucose as the carbon and energy source and other elements necessary for growth. Evaluation of the data indicated that an oxygen limited situation existed at the lower residence times causing a change in the original proposed mathematical model which placed limitations on the data. The thermophilics were especially limited by this situation due to their high metabolic rate and low solubility of oxygen in water at the thermophilic temperatures. Little difference was found in the continuous flow 'constants' at the two temperatures. This was not expected and was probably due to oxygen limitations at the lower flow rates. (Ellis-Texas)
W71-07384

EFFECTS OF ALKYLBENZENE SULFONATES ON YEASTS,
Georgia State Univ., Atlanta. Center for Disease Control.
For primary bibliographic entry see Field 05A.
W71-07387

INDUSTRIAL WASTES FROM SCOURING RUG WOOLS AND THE REMOVAL OF DIELDRIN,
Wiedman and Singleton, Atlanta, Ga.
Robert D. Wilroy.
Proceedings Eighteenth Industrial Waste Conference, Apr 30, May 1-2, 1963, Purdue University, Lafayette, Ind, p 413-417, 1964.

Descriptors: *Anerobic digestion, *Dieldrin, Lagoons, Waste water treatment, Industrial wastes.
Identifiers: *Wool scouring, *Textile mill wastes.

Wool scouring waste can be effectively treated provided consideration is given to the requirements of the amount of treatment prior to discharge of waste. Dieldrin, a moth-proofing agent, can be treated and the agent can be removed down to a level of .25 mg/liter, but further dilution is necessary to reduce this level below the toxic limit. The treatment of wool scouring waste in a lagoon is of the anaerobic type and is effective both during summer and winter in the Southeastern United States. (Robinson-North Carolina State University)
W71-07406

CURRENT WATER QUALITY CONTROL PRACTICES,
For primary bibliographic entry see Field 05A.
W71-07409

COOLING TOWERS BOOST WATER REUSE.

Environmental Science and Technology, Vol 5, No 3, p 204-206, Mar, 1971. 4 fig.

Descriptors: *Cooling towers, *Water reuse, Marketing, *Thermal pollution, Cooling water, Water treatment, Operating costs.
Identifiers: *Cooling costs.

Cooling towers are now widely used in the petroleum and petrochemical industries, especially with the present drive for thermal pollution control. The largest market for cooling towers is electrical plants, as the electrical power use doubles every ten years. Brief description is given of various types of cooling systems, together with comparison of their economical and environmental features. Hyperbolic towers are being scrutinized from the viewpoint of their large initial costs and lack of functional efficiency in the United States. Cooling tower prices range from cheap models (plywood, galvanized steel hardware) whose cost is estimated at $5 per gallon, to the more expensive ones (silica bronze, stainless steel, etc.) which will cost $12 $13 per gallon of recycled water. Water treatment requirements are presented from the viewpoint of the four common operational problems: corrosion, scale, deposition fouling and microbiological attack. (Oleszkiewicz-Vanderbilt)
W71-07438

PARING MERCURY POLLUTION,
Mark D. Rosenzweig
Chemical Engineering, Vol 78, No 5, p 70-71, Feb 22, 1971. 2 fig.

Descriptors: *Heavy metals, *Industrial wastes, *Waste water treatment, Ion exchange, Filtration, Chemical precipitation.
Identifiers: *Mercury recover, *Chlor-alkali plant waste treatment, Osaka Soda process, Ventron Corporation process.

Two already commercialized flow-schemes for treatment of chlor-alkali plants' effluents are presented, both aiming at the upgrading of waste quality and mercury recovery. In the Osaka Soda process, successfully applied for 5 years, the waste water after sedimentation and filtration, followed by ion exchange, is passed to a tower containing Osaka Soda's 'MR' resin. Mercury is cut to an undetectable level with fresh resin, although it gradually builds up to 5 ppb and is typically 2 ppb. The operating costs are about $1/1000 gal of effluent. Just commercialized Ventron process utilizes sodium borohydride (NaBH4) to precipitate mercury-yielding elemental mercury and cleaning the wastes stream well below 10 ppb mercury. Taking into account the costs of recovered mercury, operating costs of this process are about $1 per lb of recovered mercury. The author indicates also that other processes are being developed by Environmental Engineering. Pilot-scale data have demonstrated the feasibility of reducing the concentration of mercury contaminants in minutes from 1000-2000 ppm to 50 ppb. (Oleszkiewicz-Vanderbilt)
W71-07450

XAVALENT CHROMIUM: TOXICOLOGI-L EFFECTS AND MEANS FOR REMOVAL OM AQUEOUS SOLUTION,
val Research Lab., Washington, D.C.
r primary bibliographic entry see Field 05C.
1-07454

MMARY OF COMMERCIAL WASTE ATER TREATMENT PLANTS,
Force Weapons Lab., Kirtland AFB, N. Mex.
nes A. Mahoney.
ailable from the National Technical Information vice as AD-860 067, $3.00 in paper copy, $0.95 nicrofiche. Technical Report No AFWL-TR-69-, Sept 1969. 66 p, 11 fig, 5 tab, 8 ref.
ntifiers: *Sewage treatment, Evaluation, ackaged sewage plants, *Air force procurement, ckaged sewage plants, Activated sludge process, ration, Cost estimates, Reviews, Construction, ld tests, Electric power demand, Contractors, goons, Ponds, Biochemical oxygen demand.

mmercially available packaged waste water atment plants are cataloged and reviewed for sible Air Force application in limited war and d base installations. Definitions of the various thods of treatment are included. Simple curves furnished for a quick estimate of costs, power uirements, erection time, shipping volume and ght in relation to flow capacity. Included are ta- s which relate the performances of a number of nts tested by the National Sanitation Founda- n, by the manufacturer, and by the Florida State ard of Health. A list of firms which manufacture ckaged waste water treatment plants is included n appendix.
1-07458

W WE SOLVED OUR LIME SLUDGE SPOSAL PROBLEM,
ter Department, Sioux Fall, S.D.
r primary bibliographic entry see Field 05F.
1-07459

LYELECTROLYTE CONDITIONING OF UM SLUDGES,
ible and Associates, Chase City, Va.; and Vir- ia Polytechnic Inst., Blacksburg, Va.
r primary bibliographic entry see Field 05F.
1-07464

VIEW OF SLUDGE DISPOSAL PRACTICES,
rps of Engineers, Washington, D.C., Washington ueduct Div.
r primary bibliographic entry see Field 05F.
1-07465

E ORLY WATERWORKS OF THE CITY OF RIS.
gremont, Rueil (France).

ter and Water Engineering, Vol 74, No 890, p 5-146, Apr 1970. 6 fig, 1 tab.

scriptors: *Water purification, *Sludge treat- nt, Flocculation, Filtration, Chemical proper- s, Water works, Municipal water.
ntifiers: *Orly waterworks, *Alum recovery, chlorination, Dlarification, Aquazur V Filters, minum sulphate, Paris (France).

e treatment technology is utilized at a water pu- cation plant employing a coagulant recovery ocess is described. This highly automated treat- nt facility handles a normal flow capacity of 66 lion gallons per day of Seine River water. tails of the pretreatment, clarification, filtration, rilization reagent storage and feeding, pumping, m recovery, and monitoring, electrical, and con- l equipment facilities are provided. Filtration is omplished under a 3.9 foot head of water. This d is required to prevent the degassing of the ocess water in the filters during low and hot ather flows. The sludge from the clarification units is concentrated at 8g/l and then acidified with sulfuric acid to pH 3 to 3.2. The acidified sludge is fed to settling basins where the aluminum sulphate solution is recovered. The remaining sludge is neutralized with calcium carbonate in separate tanks. Physical and chemical characteristics of the water at different stages of the treatment process are presented. A flow diagram of the plant is also provided. (Nardozzi-AWWA)
W71-07470

RECALCINING LIME SLUDGE PRODUCES MULTIPLE BENEFITS,
Water Department, St. Paul, Minn.
Clifford W. Hamblin.
The American City, Vol 84, No 11, p 67-69, 115, Nov 1969. 2 fig, 2 tab.

Descriptors: *Carbon dioxide, *Water softening, Stabilization, Air pollution, Minnesota, Sludge treatment, Water works, Municipal water.
Identifiers: *Lime recalcining, *Washwater recovery, Quicklime, St Paul (Minn).

This study shows how lime recalcining and wash-water recovery at a municipal water utility can reclaim 9800 tons of 92% pure quicklime, 9950 tons of carbon dioxide and 170 million gallons of washwater annually. Extensive modifications to the existing facilities will permit handling of the 23,000 tons of dry solids produced annually while extending the life of sludge storage and reducing air pollution. Sedimentation of filter washwater is accomplished in separate settling basins. The carbon dioxide produced from the recalcining facility will be used to stabilize the softened water. It is expected excess quicklime can be recovered and sold to reduce plant operating costs. A flow diagram of the 60 ton per day raw sludge vertically constructed fluid bed type recalcining system is presented. Fuel requirements are 9 million Btu/ton of product output. Chemical characteristics of the lime sludge and the equipment required for construction are shown. (Nardozzi-AWWA)
W71-07471

NATURAL FREEZING FOR DEWATERING OF ALUMINUM HYDROXIDE SLUDGES,
Federal Water Quality Administration, Cincinnati, Ohio.
J. B. Farrell, J. E. Smith, Jr., R. B. Dean, E. Grossman, III, and O. L. Grant.
Journal American Water Works Association, Vol 62, No 12, p 787-791, Dec 1970. 5 fig, 2 tab, 9 ref.

Descriptors: *Snow cover, *Freeze-thaw test, *Lagoons, Dewatering, Phosphorus, Waste water treatment, *Freezing, Minnesota, Ohio, Sludge treatment.
Identifiers: *Filterability, *Solids contents, Aluminum sulfate, Aluminum hydroxide sludge, Ely (Minn), Cincinnati (Ohio).

Data presented provide a basis for the design of lagoons for the dewatering of aluminum hydroxide sludge by natural freezing. Temperature considerations and convective losses are considered in the freezing experiments. The freezing rate of aluminum hydroxide sludge parallels the freezing rate of water. Field testing at Ely, Minnesota showed that a snow cover could reduce the freezing efficiency of the sludge, but careful management could minimize this problem by freezing the sludge in thin layers and removing snow from frozen layers. With complete freezing, the dewaterability and solids content of the sludge can be significantly increased. Freezing in a mild climate as Cincinnati, Ohio would be successful in 1 inch layers. Layered freezing in partial freeze-thaw tests was not as a complete freezing. The ratio of phosphorus to aluminum in the sulfate form is shown to barely affect the filterability and solids content of aluminum hydroxide sludges. (Nardozzi-AWWA)
W71-07472

THE USE OF FILTER PRESSES FOR THE DEWATERING OF SLUDGES,
Johnson-Progress Ltd., Stoke-on-Trent (England).
C. M. Thomas.
Journal Water Pollution Control Federation, Vol 43, No 1, p 93-101, Jan 1971. 4 fig, 1 tab, 5 ref.

Descriptors: *Dewatering, Waste water treatment, Sludge disposal, Filtration.
Identifiers: *Filter presses, *Chemical conditioning, Water plant sludge.

The utility of a filter press to successfully dewater various waste water treatment sludges is presented. The advantages of a filter press operation are cited for a specific range of application over alternative methods as centrifugation, thickeners, vacuum filters, and pressure filters. The enumerated benefits include efficient filtration even with feed characteristic variations, minimized maintenance, improved filtrate quality, facility in cake handling, and competitive capital costs. Design consideration should be based on theory and pilot testing. Additional requirements for filter pressing may include sludge storage tanks and mixers, chemical conditioning plants, feed pumps, filter cloths, interconnecting pipework and pressure vessels, and filtrate collection trays. Conditioning, filtration cycle, feed and cake characterization, and cake thickness data are presented for water plant sludge. (Nardozzi-AWWA)
W71-07474

CHEMICAL COAGULATION OF KRAFT MILL WASTE WATER,
California Univ., Berkeley. Engineering Research Lab.; and Mississippi State Univ., State College; and International Paper Co. Mobile, Ala.
E. Joe Middlebrooks, W. E. Phillips, Jr., and Frank J. Coogan.
Water and Sewage Works, Vol 116, No 3, p IW7-IW9, Mar 1969. 4 fig, 1 tab, 4 ref.

Descriptors: *Coagulation, *Chemical oxygen demand, Biochemical oxygen demand, Color, Waste water treatment, Pulp wastes, Pulp and paper industry, Industrial wastes.
Identifiers: *Organic polymers, *Aluminum sulfate, *Kraft mill waste water, Colloidal suspensions, Suspended solids.

Colloidal suspensions which contain significant proportions of color, suspended solids, and chemical oxygen demand material in paper mill waste water can be removed by chemical coagulation with organic polymers. Analytical grade aluminum sulfate and 6 organic polyelectrolytes were tested on kraft mill waste water. Previous work with synthetic polymers and ferric sulfate is referenced. The coagulants were tested on grab samples and composite samples from the raw waste stream. The jar test procedure and parameter analysis techniques are explained. The organic polymers were equally effective in reducing chemical oxygen demand material, color and suspended solids. The aluminum sulfate was effective but tripled the sludge volume produced by the organic polymers. The coagulation efficiency changed with variations in the solution pH. None of the coagulants utilized could significantly reduce the biochemical oxygen demand of the waste. (Nardozzi-AWWA)
W71-07475

WATER TREATMENT PLANT WASTES DISPOSAL,
Orange County Sewer Districts, Orlando, Fla.
Robert McColgan.
Report to AWWA Research Foundation, Nov 11, 1970. 7 p, 2 ref.

Descriptors: *Injection wells, Sludge disposal, Sludge treatment, Lagoons, Neutralization, Dewatering, Filtration, *Water treatment, Wastes, Florida.
Identifiers: Alum coagulation, Aluminum hydroxide sludge, Activated carbon sludge, Pipeline disposal, Gamma ray sludge destruction, Nalco671,

Lake Washington, Florida Aquifer, Melbourne (Florida).

The project goal was to determine effective treatment or disposal of activated carbon and aluminum hydroxide sludges and the neutralization of the supernatant before discharge to a lake. Sludge disposal techniques included injection wells and pipeline disposal to roadbase pits. Sludge treatment methods included gamma ray sludge destruction, dewatering, and filtration. Sludge injection caused clogging of the aquifer and elimination of the groundwater as a potential supply. Pipeline disposal created a dewatering problem in the roadbase pits. A 0.1mg/l Nalco 671 polymer addition generated less sludge than radiation treatment and was as effective. Vacuum filtration, sand bed drying, centrifugation, and filter pressing concentrated sludge solids up to 20%. Basic research is recommended for sludge lagoons. Lagoon design considerations are a 2 1/2 foot maximum depth, a 10 foot clearance for dump trucks, and a buffer zone between lagoons and residential communities. (Nardozzi-AWWA)
W71-07476

RESEARCH ON WATER TREATMENT PLANT WASTE DISPOSAL,
American Water Works Association Research Foundation, New York.
Harry A. Faber.
Water and Sewage Works, Vol 117, No 11, p 379-383, Nov 1970. 4 ref.

Descriptors: *Freezing, *Dewatering, *Centrifugation, Phosphates, Lagoons, Water reuse, Water treatment, *Sludge disposal, Coagulation, Treatment facilities.
Identifiers: *Aluminum hydroxide sludge, *Lime recovery, *Ferric hydroxide sludge, Precoat vacuum filtration, Thickening, Sludge conditioning, Polyelectrolyte, Filter pressing, Primary coagulant.

A survey highlighting active research, demonstration, and in-plant studies of sludge and and filter washwater disposal. The problem of economical waste disposal techniques for purification and softening plant sludges is being investigated in various areas. The disposal of aluminum and ferric hydroxide sludges and the recalcination of lime sludge are enumerated for several dewatering processes. The survey cites references to freezing, centrifugation, precoat vacuum filtration, thickening, filter pressing, and lagooning procedures. Water reuse and phosphate removal systems are also listed. Projects examining sludge conditioning through chemical addition, and operations substituting polyelectrolytes as primary coagulants to treat filter washwater or raw water are discussed. A systematic program for the organization, coordination, and dissemination of research and demonstration projects is stressed. A central information resource program would promote pollution control technology beneficial to the water utility industry. (Nardozzi-AWWA)
W71-07477

DISPOSAL OF WASTE WATER FROM WATER FILTRATION PLANTS,
Metcalf and Eddy, New York.
G. P. Fulton.
Journal American Water Works Association, Vol 61, No 7, p 322-326, July 1969. 1 fig, 2 ref.

Descriptors: *Pollution abatement, Settling basins, Coagulation, Filtration, Sludge treatment, Sludge disposal, Waste water treatment, New York.
Identifiers: *Concentration, *Sludge freezing, *Alum recovery, Clarifier underflow, Filter backwash water, Monroe County Shoremont Plant (New York).

Processes for the successful treatment and disposal of potential pollutants from settling basin underflows and filter backwash water were examined to identify pollution abatement techniques. Limited physical and chemical characteristics of waste water were qualitatively and quantitatively reviewed to evaluate sludge freezing, alum recovery, vacuum filtration operations, and consideration was given to the disposal of water plant wastes to local sewage systems. Treatment goals of concentrating wastes and making these wastes suitable for disposal are discussed. Treatment cost is reportedly minimized by simplifying operations for personnel and limiting land area unit requirements. A settling rate of 250 gpd/ft sq was found acceptable for settling alum sludge, in its semifluid state, by using mechanical thickeners. The advantages and disadvantages of the treatment schemes are presented. Sludge freezing and alum recovery processes are referenced to plant scale operations. (Nardozzi-AWWA)
W71-07478

ALTERNATIVES FOR PHOSPHATE REMOVAL,
Neptune Microfloc, Inc., Corvallis, Oreg.
Stewart Davis.
Water and Sewage Works, Vol 117, No 10, p 336-338, Oct 1970. 2 fig, 1 tab, 2 ref.

Descriptors: *Water quality control, Tertiary treatment, Chemical precipitation, Lime, Flocculation, Phosphates, Waste water treatment.
Identifiers: *Tube settlers, *Mixed-media filter, Micro Floc, Shagawa Lake Project, Detention time, Alum.

Micro FLOC has developed a tertiary treatment process that can effectively remove orthophosphates and polyphosphates by chemical precipitation. Domestic waste water phosphous has been reduced to .5mg/l P using lime dosages of 200 to 500 mg/l CaO or alum dosages of 90 to 200 mg/l. The process combines flocculation, modular tube settlers, and mixed media filtration. Units range in size from 20 gpm to 200 gpm. Four 200 gpm units, requiring less detention time than conventional treatment systems, are being planned for Ocean Pines, Maryland. A Micro FLOC installation at Shagawa Lake has reduced effluent from 5.6 mg/l to 0.05 mg/l (PO_4 as P) using 145 mg/l alum. Similar advanced treatment processes as Battelle Northwest's 100,000 gpd trailer mounted system and a 280,000 gpd at Tualatin, Oregon are mentioned. A reference is also made to Lake Tahoe's lime coagulation system and recalcination operation. (Nardozzi-AWWA)
W71-07479

WASTE ALUM AND ACTIVATED CARBON SLUDGE SOLIDS REDUCTIONS METHODS,
Orange County Sewer Districts, Orlando, Fla.
Robert McColgan.
Report to AWWA Research Foundation, Nov 1970. 7 p, 6 fig, 2 ref.

Descriptors: *Waste storage, *Landfills, Sludge treatment, Sludge disposal, Florida, *Water treatment, Wastes, *Lagoons.
Identifiers: Alum sludge, Activated carbon sludge, Sludge transfer, Sludge thickening, Carryover, Melbourne (Florida).

A technique is described to limit alum and activated carbon sludge carryover from a waste storage lagoon of a water treatment plant. Initially, buckets were dragged through the settling lagoon to remove the sludge. This technique re-suspended settled material and produced a carryover in the effluent. A new lagoon of 2 1/2 to 3 feet deep with a 2 to 1 slope was constructed. Pumping enabled a sludge transfer from the original, primary lagoon to the new thickening lagooning. Sludge thickening was accomplished at the influent end of the lagoon, and the supernatant was recycled to the primary lagoon. The solids content of the thickened sludge was 6 to 10%. After additional drying, the sludge was used as a landfill. (Nardozzi-AWWA)
W71-07480

PLANNING OF MUNICIPAL WASTE WATER RENOVATION PROJECTS,
J. W. Porter.
J Am Water Works Assoc, Vol 62, No 9, p 543-548, Sep 1970. 3 fig, 2 tab, 6 ref.

Descriptors: *Water reuse, *Economics, *Cost comparisons, *Project planning, Water pollution control.

Increasing interest in water renovation and reuse rather than simply waste treatment and discharge is due to the severity of pollution control laws and localized shortages of water resources. Economic considerations concern cost comparisons between the water pollution control/water supply function of a water renovation facility, and the same functions in separate facilities. Technical considerations in planning a water renovation project are largely a function of the planned use of the product water. Several technical aspects are discussed including: process selection and water quality criteria, renovation system reliability, public health considerations, and pilot - demonstration work. The functions of water pollution control and water supply should be recognized institutionally, which involves cooperation between parties concerned. Five guidelines are included as suggestions in planning for public acceptance of water renovation.
W71-07515

TERTIARY TREATMENT OF SEWERAGE WATER,
Shozo Miyahara, and Tokiya Ando.
Sangyo Kogai, Vol 6, No 8, p 454-461, Aug 25, 1970. 46 ref.

Descriptors: *Tertiary treatment, *Water purification, *Water resources, *Feasibility.
Identifiers: *Sewerage water, *Japan.

Because of the increasing water need, the feasibility of sewerage water reuse is being investigated both technically and chemically. This new advanced method of utilization; tertiary treatment, is aimed at higher level purification of sewerage water beyond the secondary treatment stage. Due to projected water demand sewerage water has great potential as a new water resource if advanced technology is employed. Some problems involved in sewerage water reuse are associated with water quality including: generation of corrosion, slime, scale and ABC foaming, higher seasonal temperatures, and chloride ion concentration. Sewerage water reuse is presently limited in its application to cooling and washing uses. Discussed herein are several types of tertiary treatment for sewerage water primarily involving removal of suspended solids, nitric or phosphoric compounds, organic substances, and chlorine contained in sewerage water after secondary treatment.
W71-07516

INDUSTRIAL RE-USE OF COMBINED SEWAGE-TREATMENT PLANT EFFLUENT,
E. R. Hamilton, and C. F. Gurnham.
In: International Conference on Water for Peace, Vol 4, 1968. 12 p.

Descriptors: *Storm runoff, *Bypasses, *Water pollution sources, *Treatment facilities, Overflow, Sewage disposal, Water reuse, Illinois.
Identifiers: *Storm sewage, *Chicago (Ill), *Treatment method.

After reviewing the increasing water demands in the United States and the problems of future water shortage, the authors describe the steps taken in East Chicago, Illinois, to overcome problems of pollution and water shortage. Excess storm sewage which bypasses the sewage works enters Grand Calumet river and thence the southern part of Lake Michigan, causing serious restriction on the use of water for recreational purposes, particularly swimming. It is financially impossible to replace the combined sewerage system by a separate system

o, storm runoff is highly polluting. A scheme was erefore developed which will receive effluent m the existing sewage works and overflows of rm sewage from about one-third of the city, oviding treatment by equalization, sedimenta-n, oxidation, and biological processes. In dry ather there will be a detention period of at least days; and at peak storm periods there will be a nimal detention period of 24 hours. Discharge m the detention basins will be chlorinated and d in the overflow channel for the customary dis-ection period of 15 minutes before entering the and Calumet river. It is proposed that flows up to mgd will pass from the detention basin to a new tiary treatment plant, on which pilot-scale stu-s are being made. The quality of the effluent will only meet the anticipated standards for charge to the Grand Calumet river, but will ap-oach requirements for potable use and will be ac-otable for use as cooling water and often as in-strial process water. The plant will be flexible in eration, and water of almost any desired quality uld be tapped off at various points for sale to in-stry.
71-07517

ORM WATER/SEWAGE CONTROL,
lter J. Talley.
luent and Water Treatment Journal, Vol 10, No p 592-595, Oct 1970.

scriptors: *Screens, Equipment, Waste water atment.
ntifiers: *Combined sewers, *Storm overflows, aste water concentrator.

e combined sewer overflow problems affect ap-ximately 36 million people in England and les, and 51 million people in the United States. er a year's period, estimates on the percent of uid sanitary sewage that overflows with the rm overflow in combined sewer systems vary m 2% to 10%. High-rate, fine-mesh screens and waste water concentrator, which are the oducts of research basically directed at finding ans for storage and treatment of storm/sanitary rflows, are discussed briefly.
71-07528

N POLYMERS HELP YOUR COLLECTION STEMS,
V. Santry.
ter Wastes Eng, Vol 7, No 11, p 47-48, Oct 70. 2 fig, 1 ref.

scriptors: *Overflow, *Sewers, Flow rate, Peak ds, Waste water treatment.
ntifiers: *Polymers, *Collection systems.

e use of polymers, formed by chain grouping of ilar organic molecules being cationic, anionic, nonionic, reduce fluid flow friction resulting in increased velocity in a sewer during application varying distances downstream. What happens in system is that the long chains of high molecular anic material dampen the eddy viscosity condi-ns making greater use of streamlining and the ex-sion of the laminar boundary layer into the tur-ent flow region. At present polymers appear to limited to short time uses that occur because of k flows and other emergencies.
71-07529

ORM-WATER RETENTION CAN ORK...AND PREVENT THE HEAVILY POL-TED 'FIRST FLUSH' FROM OVERFLOWING DAMAGE THE RECEIVING RIVER,
primary bibliographic entry see Field 05G.
71-07530

NE-MESH MECHANICAL SCREEN CONCEN-ATES PEAK WASTE LOADS.
ration Eng, Vol 1, No 10, p 8-10, Jun 1970. 2

Descriptors: *Waste water treatment, *Pollution abatement, *Overflow, *Sewers, Storm runoff, Equipment.
Identifiers: *Waste water concentrator.

A new product known as the waste water concentrator uses a mechanical screening principle to reduce pollution caused by the overflow from combined storm and sanitary sewage systems during periods of heavy rainfall. In storm overflow service, the concentrator can augment a treatment process via high-rate, fine mesh centrifugal screening which relieves the existing system of its hydraulic overload. It was demonstrated that the concentrator is capable of removing 99 percent of the floatable and settleable solids, 34 percent of the suspended solids, and 27 percent of the COD from sanitary waste. A description of the operation, apparatus, and maintenance involved in the concentrator's performance is given.
W71-07534

PRIMARY WATER TREATMENT AIDED BY COMPACT SEPARATOR.
Sweco, Inc., Los Angeles, Calif.

Chemical Engineering, Vol 77, No 15, p 48, 50, Jul 13, 1970. 1 fig.

Descriptors: *Sewage treatment, *Waste water treatment, *Sewage, *Storm runoff, Pollution abatement.
Identifiers: *Waste water concentrator.

A new kind of primary waste water treatment has been introduced to help pollution abatement specialists solve two of their most recurrent headaches: inadequate acreage for large enough settling basins, and excessive waste water loads resulting from heavy rainfalls. The waste water concentrator, as this unit is called, was designed primarily for municipal sewage treatment.
W71-07535

A GROWING MARKET FOR WATER AND WASTE WATER TREATMENT EQUIPMENT,
K. L. Kollar, and William G. Youngwirth.
Water Sewage Works, Vol 117, No 9, p 319-325, Sept 1970. 7 tab, 2 chart, 8 ref.

Descriptors: *Treatment facilities, Equipment, Evaluation, *Construction equipment, *Surveys, Waste water treatment, Costs.

This report summarizes and compares two studies (1965 and 1968) which are based on the response of manufacturers to a questionnaire on manufacturing plant production capacity and value of shipments of equipment used only in water and waste water treatment plants. Both surveys accounted for about 95% and 70% of equipment sales to municipal water and waste water treatment utilities and industrial water and waste water treatment respectively. In 1968, $248.4 million was spent for water and waste water treatment equipment by municipalities and industry with a 64..% increase in pollution control equipment. Tabled information includes: total expenditures, equipment shipments, structures, production capacities, and GNP comparisons. A list of equipment definitions is given.
W71-07539

THE MICROBIOLOGY OF BUILT UP POULTRY LITTER,
Edinburgh Univ. (Scotland). Dept. of Bacteriology.
Henrietta Schefferle.
Journal Applied Bacteriology, Vol 28, No 3, p 403-411, 1965. 5 tab, 7 ref.

Descriptors: *Microbiology, *Bacteria, Farm wastes, Poultry, Odor, Fungi, Aerobic conditions, Laboratory tests, Alkalinity, Enteric bacteria, Lactobacillus, Hydrogen ion concentration, Temperature, Moisture content.
Identifiers: Litter, Coryneform bacteria, Enterococci.

The numbers of viable bacteria in built up poultry litter were found to be 10 to the 10th power - 10 to the 11th power/g fresh weight and appeared to be little affected by factors such as age, temperature, moisture content and pH. Counts for unused litter and poultry droppings were lower. In built up litter of high alkalinity coryneform bacteria were predominant; micrococci occurred sporadically and small numbers of nocardias, streptomycetes, aerobic spore formers and streptococci were encountered. A variety of Gram negative bacteria also occurred, the numbers of which appeared to be controlled by alkalinity; they were less abundant in litters where the pH and buffering capacity were high. Strongly alkaline conditions also tended to lower the fungal counts but had no effect on the count of enterococci. (Christenbury-Iowa State)
W71-07548

INVESTIGATIONS ON FLY CONTROL BY COMPOSTING POULTRY MANURES,
Orange County Health Department, Santa Ana, Calif.
Roy E. Eastwood, Jimmy M. Kade, Robert B. Schoenburg, and Harold W. Brydon.
Journal of Economic Entomology, Vol 60, No 1, p 88-98, Feb 1967. 7 fig, 7 tab, 5 ref.

Descriptors: *Farm wastes, *Poultry, Aerobic conditions, Temperature, Degradation, Decomposing organic matter, Aeration, Mixing, Larvae, Bulk density, Volume, Moisture content, Nitrogen.
Identifiers: *Composting, Fly problems, Fly pupae, Windrows.

Windrow composting of poultry manure was investigated during several months of the year. Results obtained indicated that manure does not have to be ground prior to composting. Bulking and drying materials are not required in composting poultry manure. Fly larvae were reduced in numbers during the composting process so that they would not create a fly problem. Poultry manure once composted is not suitable as an oviposition site for adult flies and the subsequent development of larvae. A twice-weekly turning schedule with a manure spreader is desirable to help prevent fly larvae from pupating and emerging by bringing them into contact with the hot interior of the pile. (White-Iowa State)
W71-07549

DAIRY SET-UP FOR 200 COWS,
Guy Faulkner.
Power Farming, p 38-39, Jan 1970. 6 fig.

Descriptors: *Farm wastes, Lagoons, Slurries, Cattle, Hogs, Silage, Cereal crops, Costs, Waste water treatment, *Oxidation lagoons.
Identifiers: *Dairy cattle, *Evaporative lagoon, Free stall housing, Milking parlor, Farrowing houses, Collecting yard.

The article describes the layout and features of a newly developed dairy operation for 200 cows. Features include three 120 feet long steel framed loafing barns and a 100,000 cu. ft. capacity evaporative lagoon. The solidified contents of the lagoon will be dug out by a contractor in summer. A 200 sow pig unit has also been established on this 500 acre Sussex farm. (White-Iowa State)
W71-07550

FARM WASTE DISPOSAL SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
A. C. Dale.
Cooperative Extension Service, Purdue University, AE-80, Feb 1971. 10 p, 1 tab, 5 fig, 34 ref.

Descriptors: *Farm wastes, *Waste disposal, *Lagoons, *Oxidation lagoons, Aerobic conditions, Anaerobic conditions, Algae, Organic matter, Volume, Drying, Odor, Nitrogen, Aeration, Hogs, Cattle, Poultry, Research and development, Soil, Soil contamination.

Identifiers: *Disposal systems, *Land disposal, Oxidation ditches, Aerated lagoons, Composting, Refeeding, Anhydrous ammonia, Waste characterization.

In this publication the present available alternatives for animal waste disposal and criteria for selection of these methods are presented. A brief literature review tells of research being done in all areas and aspects of animal waste disposal. Land disposal still remains the most suitable and most widely used disposal method. Research indicates that approximately 250 pounds of nitrogen can be added to each acre of soil without unduly polluting it. Other methods of disposal discussed are aerobic, anaerobic, and mechanically aerated lagoons, as well as oxidation ditches, composting, and drying. Recommendations are made for the chemical treatment of animal wastes to reduce odors while spreading. (White-Iowa State)
W71-07551

AGRICULTURAL WASTE IN AN URBAN ENVIRONMENT.
New Jersey Animal Waste Disposal Task Force.

Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' Atlantic City, New Jersey, Sept 14-17, 1970. New Jersey Animal Waste Disposal Task Force. 256 p.

Descriptors: *Farm wastes, *Water pollution control, *Environment, Waste disposal, Cities, Grants, Research and development, Legislation, Communication, Poultry, Cattle, Odor, Lagoons, Aeration, Nitrogen, Moisture content, Aeration, Costs, Sewage, Agriculture, *Waste water treatment, Waste treatment.
Identifiers: *Urban environment, Land-Grant Colleges, Funding, Public relations, Refeeding, Land disposal, Research needs, Biological systems, Waste handling, Research funds, Recycling.

The groundwork for the conference 'Agricultural Waste in an Urban Environment,' was laid several years ago when the New Jersey Animal Waste Disposal Task Force was formed. Since its formation the Task Force has moved in four directions in an effort to find a solution to the agricultural waste problem. These have consisted of studying current laws, making maximum use of available methods of disposal, utilization and odor control, encouraging research, and informing the public of the issues. The conference was based on these four approaches. Various resources available to deal with the problem were brought together and, consequently the attitude of people of all levels of the economy, both rural and urban, was determined; additional resources were discovered; new interests were created; better communications were established; the latest technology was reviewed; and a plan of action was developed. A resolution passed by the delegates calls for a national conference on this matter by appropriate Federal officials. The main purpose of the conference was to find a way for rural and urban communities to develop their economies and reach their full potentials without becoming a nuisance to each other. (See also W71-07553 thru W71-07558) (White-Iowa State)
W71-07552

WASTE DISPOSAL AND POLLUTION, POULTRY PROCESSING,
Ralston Purina Co., St. Louis, Mo. Engineering Waste Disposal Plant.
Rowland Retrum.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 64-75, Sept 14-17, 1970. 13 tab, 5 fig.

Descriptors: *Farm waste, *Poultry, Water pollution, *Waste water disposal, Sewage, Odor, Biochemical oxygen demand, Organic matter, Annual costs, Aeration, Aerobic treatment, Anacrobic digestion, Lagoons, Dissolved oxygen, Condensers, Incineration, Drying.
Identifiers: *Poultry processing, Solids, Rendering plants, Odor control, Chemical scrubbing, By-products.

It is the author's intention to attempt to define the problem of waste disposal and pollution with respect to poultry processing, to describe efforts now being made toward solution, to review cost effects, and to indicate promixing directions for accelerated investigation. The problems considered as the major pollution problems are feather litter, water pollution, sewage treatment odors, and rendering odors. Costs and other data are computed for an 80,000 bird per day broiler processing plant with a small associated rendering plant. Suggestions are made for decreasing the total waste load while increasing income. Systems for reducing the odor from both sewage treatment and rendering plants are explained. The odor problem is complex and there are no pat solutions. Any solution will be expensive. (See also W71-07552) (White-Iowa State)
W71-07553

FUNDING FOR AGRICULTURAL WASTE RESEARCH,
Cornell Univ., Ithaca, N.Y.
N. C. Brady.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 89-98, Sept 14-17, 1970.

Descriptors: *Farm wastes, Research and development, Environment, Agriculture, Water pollution, Foods, Domestic wastes, Industrial wastes, Properties, Waste disposal, Grants, Population, Legislation, Education, *Costs.
Identifiers: *Research funds, Agricultural waste problem, Environmental quality, Intensive animal agriculture.

Three basic assumptions are made on which to establish a common ground. First the agricultural waste problem is serious. Secondly, agricultural waste problems are not extensions of those waste problems facing municipalities and industry. Thirdly, the solutions to the agricultural waste problem require knowledge that we do not now have. These assumptions lead to the fact that research and adequate funding are badly needed. The following are avenues that could be developed for solving agricultural waste problems in an urban environment: (1) Agriculture and its related industries must see environmental pollution as a major threat to themselves; (2) Agriculture should work closely with state and Federal legislators to obtain funding for direct application to State Experiment Stations and USDA research agencies; (3) Greater coordination between agencies is needed so that a larger proportion of the Federal Water Quality Administration's research funds can be used for animal waste studies; (4) We must not ignore the possibilities of reorienting research funds already available, and; (5) The training and education of professionals in agricultural waste management is needed. (See also W71-07552) (White-Iowa State)
W71-07554

DISPOSAL OF SOLID AGRICULTURAL WASTES - CONCEPTS AND PRINCIPLES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
Raymond C. Loehr.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 126-134, Sept 14-17, 1970. 12 ref.

Descriptors: *Farm wastes, *Research and development, Waste disposal, Drying, Dehydration, Incineration, Beneficial use, Environment, Water pollution, Temperature, Moisture content, Odor, Feeds.
Identifiers: *Research needs, *Land disposal, Composting, Refeeding, Pyrolysis, Utilization, Waste management.

The state of development regarding suitable disposal methods for agricultural solid wastes is in an embryonic stage. A variety of techniques are possible but little information exists on the broad applicability of the techniques or on the detailed design and use parameter for the techniques with these wastes. Because of technical or economic difficulties, composting, drying and dehydration, incineration, and pyrolysis have not found wide application for animal solid wastes. Refeeding and land disposal offer the greatest opportunities for satisfactory disposal of animal wastes in the near future. The important research needs in the area of animal waste disposal include: (1) more thorough investigation of promising techniques, (2) utilization of non-traditional concepts, (3) evaluation of feasible disposal methods as part of animal production operations, (4) more and detailed cost information, and (5) broad interdisciplinary approaches and studies. (See also W71-07552) (White-Iowa State)
W71-07556

RECYCLING AND UTILIZATION OF BIODEGRADABLE WASTES IN THE SOIL,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Agricultural Engineering.
Charles H. Reed.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 135-139, Sept 14-17, 1970. 2 fig.

Descriptors: *Farm wastes, *Biodegradation, Waste disposal, Water pollution, Nitrogen, Nitrogen compounds, Nitrogen cycle, Research and development, Conservation, Soil, Environment, Agriculture.
Identifiers: *Recycling, Utilization, Biological systems, Materials balance.

The survival of man depends upon the intelligent use of agriculture with its inumerable physical, chemical and biological systems and cycles. The author emphasizes that all biodegradable organic wastes could and should be recycled and utilized by natural biological systems on specialized sites on farms. The ability of soils to filter and degrade organic wastes and immobilize potential pollutants is widely recognized. Plants are among the best known converters of nitrogenous compounds to non-pollutional materials. A figure depicts the nitrogen cycle and how organic wastes are recycled by the soil. A chart is presented showing a program for recycling biodegradable wastes. To achieve this objective an interdisciplinary approach must be taken, which will necessitate much research requiring many tax dollars. (See also W71-07552) (White-Iowa State)
W71-07557

AGRICULTURAL WASTE RESEARCH NEEDS,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Agricultural Economics.
George W. Luke.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 140-141, Sept 14-17, 1970.

Descriptors: *Farm wastes, *Environment, Water pollution, Grants, Population, Surveys, Waste disposal, Volume, Odor, Livestock, New Jersey.
Identifiers: *Waste handling, Masking agents, Environmental quality, Residential areas.

Aided by a grant from the State Department of Health, the Department of Agricultural Economics conducted a survey of livestock enterprises in four agricultural counties in New Jersey to determine the volume of waste, the methods of handling waste, the cost of waste disposal, the attitude of farmers toward the problem of animal waste, and the location of farms relative to residential areas. The results of this survey are given and evaluated. Between 600,000 and 1 million tons of waste are produced and disposed of in the four counties an

ally. The typical method of disposal is on the d. Because the farms are small and confine only all numbers of animals, the threat to environntal quality is minimal. The closer to residential as the more meticulous the farmers are in hanng waste. Public agencies seeking to maintain vironmental quality should consider educational grams emphasizing the most acceptable pracs for the average size livestock farm. (See also 1-07552) (White-Iowa State)
1-07558

CYCLE WATER QUALITY FROM A BLAST RNACE,
rnegie-Mellon Univ., Pittsburgh, Pa. Mellon t. Water Resources.
ncis Clay McMichael, Edward D. Maruhnich, l William R. Samples.
rnal Water Pollution Control Federation, Vol No 4, p 595-603, Apr 1971. 9 p, 7 fig.

scriptors: *Water reuse, *Water pollution con-, *Industrial wastes, Reclaimed water, Monitor-, Water quality, Water chemistry, Recirculated er.
ntifiers: *Blast furnace wastes.

t scrubbing of blast furnace flue gases resulted waste water containing dissolved organic and rganic materials. To reduce the level of pollut discharges, a portion of the clarifier overflow recycled. Variations in gas wash water quality related, at least partially, to furnace operation. cycle gas-cleaning systems can be operated ilarly to once-through systems, but the quality he recycle water must be monitored to maintain cium carbonate equilibrium. The dynamics of servative tracers in recycle water can be easily deled. Successful predictions of the time ponse of the cleaning system to changing levels blowdown or make-up water can be made. (K-p-USGS)
1-07643

OLING TOWERS,
ck and Veatch, Kansas City, Mo.
primary bibliographic entry see Field 05G.
1-07645

TER UTILIZATION AND WASTE CONOL IN THE TEXTILE INDUSTRY,
rth Carolina State Univ., Raleigh. School of tiles.
l E. Bryan.
rth Carolina Water Resources Research Inute, Raleigh, Nov 1969. 7 p, 1 tab. OWRR Pro A-035-NC (1).

scriptors: *Water reuse, Biochemical oxygen dend.
ntifiers: Textile mill wastes, Dyehouse wastes, stuffs, *Warp sizes, Desizing, *Organic solts, *Decolorizing.

s project was directed toward determining the ncipal sources of pollution in the textile indus- the effort made by the industry to control pol-on and, from these, fruitful research problems extile waste control. From surveys, plant-inction trips, and discussions with representatives ndustry, government and university, the follow- appeared to be areas in which important work be done: (1) The recovery of warp sizes for se or for solid disposal from desizing wastes. (2) elimination of color by decolorizing or by very for reuse or disposal from dye wastes. (3) advanced treatment of wastes leading to water se. (4) The solvent processing of textiles in er to reduce disposal problems related to waste er. (5) It is advisable in every case before wastetment facilities are constructed to make in-t survey of processes. A survey of the opera-s of a small textile plant led to the use of smaller unts of chemicals in some cases and substitu- of chemicals in others, both of which brought ut a substantial reduction of BOD in the plant's uent. (Bryan-North Carolina State Univ)

W71-07679

ELECTRODIALYSIS FOR DESALTING HAWAIIAN BRACKISH GROUNDWATER: A FIELD STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 03A.
W71-07681

5E. Ultimate Disposal of Wastes

GROUNDWATER POLLUTION FROM SANITARY LANDFILLS AND REFUSE DUMP GROUNDS, A CRITICAL REVIEW,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
A. E. Zanoni.
Wisconsin Department of Natural Resources, Research Report 69, 1971. 43 p, 8 tab, 62 ref.

Descriptors: *Landfills, *Water pollution, *Waste dumps, *Solid wastes, *Leaching, *Groundwater, Hydrogeology, Water pollution sources, Groundwater movement, Percolation, Water management, Impaired water quality, Waste disposal, Garbage dumps.
Identifiers: *Groundwater pollution, Landfill pollution effects.

A critical review is presented of the important literature covering the area of the groundwater pollution potential from sanitary landfills and dump grounds. This is followed by a review of the practices in twenty-one states in the U.S. related to this same topic. Based on the information derived from these two sources, a series of recommendations are suggested to regulatory agencies concerned with the task of approving and licensing solid waste disposal sites. It is emphasized that a regulatory agency should have available a geologist, ideally one trained in hydrogeology, to assist in sanitary landfill site selection processes. He should accumulate geological data and broadly outline areas considered as either good or poor potential landfill sites. Extreme caution should be exercised before approving ground disposal of industrial wastes. Monitoring wells should be used in cases where doubt exists as to the future effects of a particular landfill on groundwater supplies. The regulatory agency should follow a policy of slowing down the refuse degradation process by minimizing water percolation through refuse masses to provide for leachate attenuation. The regulatory agency should encourage regional or district approaches to solid wastes collection and disposal. As a rule, it should prohibit the use of abandoned rock, gravel or sand quarries as sites for refuse disposal. Regulatory agencies should support research in the area of ground water pollution. (Poertner)
W71-07194

DISPOSAL WELL PROBLEMS IN CHICAGO AND BAKERSFIELD AREAS,
Consoer, Townsend and Associates, Chicago, Ill.
Ralph G. Berk.
ASCE National Water Resources Engineering Meeting, Phoenix, Arizona, Jan 11-15, 1971. Meeting Preprint 1302. American Society of Civil Engineers, Jan 1971. 28 p, 3 fig, 5 ref. Price $0.50.

Descriptors: *Industrial wastes, *Water pollution control, *Waste disposal, *Injection wells, *Wells, *Liquid wastes, *Hydrogeology, Chemical wastes, Well casings, Drilling, Drilling equipment, Phenols, Brine disposal, Geological engineering, Geologic control, Geologic investigations, Groundwater, Aquifers.
Identifiers: *Waste disposal wells, Well drilling problems.

Methods used and problems encountered are described in drilling two deep injection wells intended for the disposal of industrial liquid wastes. One well was drilled to a depth of 2,629 feet in the Chicago, Illinois area for disposal of 1,200 barrels per day of highly alkaline brines and phenols having a specific gravity of 1.15. The other well was drilled in the vicinity of Bakersfield, California for the disposal of cannery waste liquid from the San Joaquin Valley canneries. This well was to be capable of accepting 18,000 barrels per day of caustics, chlorides, and relatively small amounts of hydrochloric acid and vegetable oils--along with 100 ppm of suspended solids, 4,000 to 10,000 ppm total dissolved solids, 300 to 13,000 ppm BOD and 100 to 48,000 ppm COD, with a pH of 10.0 plus. Use of a combination well casing and injection tubing in the form of Saran-lined steel pipe, although of greater initial cost than the standard design of steel oil-well casing and plastic injection tube, has off-setting physical and economic advantages. With the vugate fractured Devonian disposal zones in the Chicago disposal well, the vacuum produced in injecting the liquid waste would have collapsed the smaller diameter injection tube. (Poertner)
W71-07195

HYDROLOGIC IMPLICATIONS OF SOLID-WASTE DISPOSAL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-07238

NEW SEWAGE DISPOSAL SYSTEM AT TAHOE CITY.

Water and Sewage Works, Vol 118, No 1, p 6-8, Jan 1971.

Descriptors: *Sewage disposal, *Pumping plant, Water pollution, *Sewage effluent, Septic tanks, Pipelines, Sewage treatment, Springs, Percolation, California, Waste water treatment.
Identifiers: Tahoe City (Calif).

The 1968 California's law requiring the exportation of all sewage from the Lake Tahoe basin by January 1, 1972 inspired Tahoe City to come up with this imaginative disposal system. It utilizes three high speed pumps to lift the effluent 1400 ft. to the 'Cinder Cone' disposal area. This effluent is the outcome of a primary treatment plant which chlorinates and clarifies the sewage. The sludge cake is trucked 20 miles away and buried. The effluent flows to well compacted holding ponds and is then lifted to the 'sponge like', trench laced disposal area. Various studies were carried out and are still being conducted on the area and the draining springs. So far an increase of volume was detected with no adverse effects. (Rayyan-Texas)
W71-07368

HYDROLOGIC FACTORS AFFECTING THE UTILIZATION OF LAND FOR SANITARY LANDFILLS IN NORTHERN HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 07C.
W71-07638

SUMMARY OF INTERIM GUIDELINES FOR DISPOSAL OF SURPLUS OR WASTE PESTICIDES AND PESTICIDIE CONTAINERS.
Working Group on Pesticides, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-07699

PROCEEDINGS OF THE NATIONAL WORKING CONFERENCE ON PESTICIDE DISPOSAL, AT NATIONAL AGRICULTURAL LIBRARY, BELSVILLE, MARYLAND, JUNE 30 and JULY 1, 1970.
Working Group on Pesticides, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-07700

GROUND DISPOSAL OF PESTICIDES: THE PROBLEM AND CRITERIA FOR GUIDELINES.
Working Group on Pesticides, Washington, D.C.

For primary bibliographic entry see Field 05B.
W71-07701

5F. Water Treatment and Quality Alteration

THE ROLE OF OXIDATION PONDS IN IMPROVING ENVIRONMENTAL HEALTH IN DEVELOPING COUNTRIES,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 05D.
W71-07083

SURVIVAL OF ENTERIC BACTERIA AND VIRUSES IN MUNICIPAL SEWAGE LAGOONS,
New Hampshire Univ., Durham. Dept. of Microbiology.
For primary bibliographic entry see Field 05D.
W71-07094

BACTERIA REMOVAL IN OXIDATION PONDS,
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-07095

CHLORINATION OF WASTE POND EFFLUENTS,
Sacramento State Coll., Calif.
For primary bibliographic entry see Field 05D.
W71-07096

FUNDAMENTAL PRINCIPLES OF SEWAGE CHLORINATION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05D.
W71-07132

EVALUATION OF ADVANCED TREATMENT PROCESSES FOR IMPROVING PLANT PERFORMANCE,
North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering; and North Carolina Univ., Chapel Hill. Sanitary Engineering and Water Resources Program.
For primary bibliographic entry see Field 05D.
W71-07352

HOW WE SOLVED OUR LIME SLUDGE DISPOSAL PROBLEM,
Water Department, Sioux Fall, S.D.
Paul V. Sanders.
Public Works, Vol 100, No 2, p 88-89, Feb 1969. 3 fig.

Descriptors: *Softening plant, Calcium carbonate, Lagoons, Sludge disposal, South Dakota, Water softening, Water treatment, Sludge treatment, Water works.
Identifiers: *Solids disposal method, Sioux Falls Water Department (SD).

The City of Sioux Falls required additional sludge drying bed capacity to handle 29 tons (dry weight) per day of calcium carbonate sludge. Since the expansion of existing facilities near to the softening plant was impossible, plans were made to pump the sludge 4550 ft to an elevation of 50 ft and provide gravity flow 1900 ft at a 5% grade. The waste generated during the construction of the lagoons that will provide 20 year storage is being disposed of in a nearby drainage ditch. Farmers and fertilizer companies are removing this material as needed. The sludge is pumped by a 4-inch Model D L Wemco pump in a 6-inch pressure line to low elevation areas at present. The line to the new facilities will be kept free by periodic flushing with a clean water service. The Water Department is working on new disposal applications for the sludge including uses as soil stabilizers, crop and pasture fertilizers, and soil sweeteners. (Nardozzi-AWWA)
W71-07459

ANN ARBOR'S RECALCINING PROCESS AND PROBLEMS,
Ann Arbor Utilities Department, Mich.
James C. Scott.
Journal American Water Works Association, Vol 61, No 6, p 285-288, June 1969. 3 fig.

Descriptors: Construction costs, Maintenance costs, Operating costs, *Sludge disposal, *Water treatment, *Wastes, Michigan, Water works, Water softening.
Identifiers: *Lime recalcining facility, Lime sludge, Ann Arbor (Mich).

Although a comprehensive report on Ann Arbor's water needs showed that the lagooning of lime sludge is an adequate disposal technique, the development of a lime recalcining facility was undertaken. The cost of the 24 ton per day lime reclamation facility is estimated at $1,200,000.00 including handling and treatment of the sludge from the clarifier to the finished lime storage tanks. The basic format is outlined of the process methodology from the lime sludge withdrawal to a lime product. The problems associated with this installation are those arising from personnel requirements, type of operation characteristics of sludge collected, winter equipment maintenance, and other equipment needs. The cost estimate is shown to be highly variable and a study of the proposed site and surroundings among other factors must be carefully evaluated. The problems are related to construction, maintenance, and operating costs. (Nardozzi-AWWA)
W71-07460

LAGOONING AND FREEZING FOR DISPOSAL OF WATER PLANT SLUDGE,
Metcalf and Eddy, Inc., Boston, Mass.
Stephen L. Bishop, and George P. Fulton.
Public Works, Vol 99, No 6, p 94-96, June 1968. 2 fig.

Descriptors: *Lagoons, *Freezing, Coagulation, *Water treatment, *Water works, Municipal water, New York, Sludge disposal, Sludge treatment, Wastes.
Identifiers: *Waste sludge storage, Gelatinous hydroxide sludge, Filter washwater, Shoremont Water Treatment Plant (NY).

The treatment of gelatinous hydroxide sludge and filter washwater from water filtration plants is a recognizable problem in pollution abatement. Alum recovery, vacuum filtration, and discharge of these wastes to sewerage systems are among some available treatment schemes. The advantages and disadvantages of these processes are discussed. Lagoons are shown to effectively settle and thicken sludges from the coagulation phase of the clarification process. Design parameters and sludge characteristics are given for the Shoremont Water Treatment Plant. In addition to providing waste sludge storage, the utility of lagoons for freezing the sludge as a treatment is discussed. The freezing process releases the water of hydration from hydroxide sludges and concentrates the sludge significantly upon thawing. This process is economical in climates where natural freezing could be used. At the Shoremont plant, the sludge concentration increased from 3.5 to 17.5% and the volume decreased considerably after freezing. Design considerations and operating procedures for lagoon-freezing operations are presented. (Nardozzi-AWWA)
W71-07461

ALUM RECOVERY FOR FILTRATION PLANT WASTE TREATMENT,
Metcalf and Eddy, New York.
George P. Fulton.
Water and Wastes Engineering, Vol 7, No 6, p 78-81, June 1970. 2 fig, 3 ref.

Descriptors: *Hydrogen ion concentration, *Filtration, Coagulation, Settling basins, *Water treatment, Water works, Wastes, Sludge treatment.
Identifiers: *Alum recovery, *Aluminum hydroxide sludge, *Acidulation, Thickener, Suspended solids.

Process considerations to be evaluated for alum recovery from an aluminum hydroxide sludge are described. The suspended solids content and other impurities contributing to the nature of the waste are examined with reference made to specific operating conditions and raw water quality. The advantages of a preliminary thickener before the acidulation step are explained. A settling basin overflow rate of 250 gpd/ft sq and a pH of 2.0 is considered to enhance sludge settling in final solid separation. A 10-minute minimum detention time is suggested for the acidulation step. An alum solution between 1 and 2 % should be obtained for an efficient operation. Filtration plants in the 200 to 500 mgd range with raw water suspended solids at 20 mg/l indicate recovery costs to be $3 to $5 per million gallons water produced. The utility of alum recovery is cited. (Nardozzi-AWWA)
W71-07463

POLYELECTROLYTE CONDITIONING OF ALUM SLUDGES,
Quible and Associates, Chase City, Va.; and Virginia Polytechnic Inst., Blacksburg, Va.
Henry M. Bugg, Paul H. King, and Clifford W. Randall.
Journal American Water Works Association, Vol 62, No 12, p 792-795, Dec 1970. 6 fig, 1 tab, 6 ref.
OWRR Project A-030-VA (1).

Descriptors: *Zeta potential, Dewatering, Water treatment, Wastes, Sludge treatment, Filtration, Metals.
Identifiers: *Polymer conditioning, *Specific resistance, Biological activity, Alum sludge, Jar test, Nalco, Polyelectrolytes.

Data show that alum sludge is more amenable to dewatering by gravity drainage or vacuum filtration with polymer conditioning. Water plant wastes are potential pollutants containing metallic ions and organic material that deplete the oxygen resources of a watercourse while inhibiting natural biologic activity. The polymers investigated were 2 cationic, 2 nonionic, and 3 anionic polyelectrolytes manufactured by Nalco. Jar tests showed that sludge-polmer mixing beyond 2 minutes caused a break up in the agglomerated floc. The cationic polymers were effective over a low pH band and the other polyelectrolytes were efficient in the pH 6.0 to 10 range. Anionic polymers performed best at the 2% sludge concentration and unadjusted pH of 6. Data are presented for the parameters of specific resistance and zeta potential for conditioned and unconditioned sludge. Bench-scale sand-bed drainage studies on a 4.2% alum sludge showed that conditioned material with 100mg/l of anionic polymer dewatered in one-fifth the time of unconditioned material. (Nardozzi-AWWA)
W71-07464

REVIEW OF SLUDGE DISPOSAL PRACTICES
Corps of Engineers, Washington, D.C., Washington Aqueduct Div.
John W. Krasauskas.
Journal American Water Works Association, Vol 61, No 5, p 225-230, May 1969. 1 tab, 15 ref.

Descriptors: *Sludge disposal, Settling basin, Lagoons, Centrifugation, Sludge treatment, *Water treatment, Wastes, District of Columbia, Filtration, Water quality act, Legislation, Water works, Municipal water.
Identifiers: *Filter washwater, *Basin sludge, Sludge freezing, Filter press, Barging.

This review indicates that additional legislation will implement the Water Quality Act of 1965 and control the discharge of water treatment plant wastes to natural watercourses. The Washington Aqueduct Division conducted a survey of United States water treatment plants that showed that filter washwater and basin sludge were discharg

urface waters in the majority of plants. A list of earch centers and treatment facilities studying tment processes is provided. The study shows the sludge composition of water plant wastes highly dependent upon the source water and chemicals utilized for treatment. Reference is le to several sludge disposal methods. These hods include discharge to streams, storm ers and sanitary sewers, settling in lagoons, ge freezing, centrifugation, vacuum filtration, r pressing, wedge wire filtration, sand drying s, and barging. Some design parameters, equip- t operating characteristics and cost data are n for actual installations. (Nardozzi-AWWA)
1-07465

EATMENT PLANT WASTE DISPOSAL IN GINIA,
ginia State Water Control Board, Richmond.
R. Sutherland.
rnal American Water Works Association, Vol No 4, p 186-189, Apr 1969. 2 tab, 11 ref.

criptors: *Sedimentation basin, *Filters, oons, Recirculated water, Ultimate disposal, ater treatment, Sludge, Virginia, Standards, ams, Wastes.
tifiers: *Filter washwater.

part of a stream standards implementation pro- n for the control of pollution caused by sewage, strial, or other wastes, the Virginia State Water trol Board will provide specific provisions for control of water treatment plant wastes. Four eral water quality stream standards are pro- d. Water plant waste characteristics vary con- rably with raw water quality, treatment cesses, cyclic filter backwashing and sedimenta- basin cleaning. Bacteriological problems were significant, but waste solids concentrations and idity were extremely high. The advantages of tc lagooning, washwater recirculation, and sand drying are presented. Design parameters and rating and capital costs are referenced to waste er characteristics and plant capacity. Vacuum ation, centrifugation, alum recovery, recalcin- and discharge to sewage treatment plants of er plant wastes are considered. The board's pol- is expressed and the applicability of this policy scussed for new and existing water plant facili- (Nardozzi-AWWA)
1-07466

TOMITE FILTRATION SLUDGE POSAL.
erican Water Works Association, New York.

rnal American Water Works Association, Vol No 8, p 507-509, Aug 1970. 1 tab.

criptors: *Solid wastes, *Liquid wastes, Sludge osal, Water treatment, *Filtration, atomaceous earth, Separation techniques, Slur-

problem is considered of disposal of sludge n diatomite filtration operations with specific sideration given to potable water treatment. A e is presented comparing the characteristics of t process wastes from diatomite filtration and ventional filtration plants. Several slurry osal methods are discussed. Although a omite filtration slurry is stated to be a good soil ditioner for agricultural lands, the discolored te material is esthetically objectionable. The antages and disadvantages of disposing slurries ewerage facilities are shown with consideration n to the abrasive and settling nature of the te. Settling lagoons, vacuum drum filtration, pressure bag filtration are suggested as solids aration techniques. Disposal of liquid wastes be accomplished by discharge to sanitary ers and recovery. Solid wastes will provide good lfill. A number of secondary waste uses are d. (Nardozzi-AWWA)
1-07467

RECLAMATION OF FILTER BACKWASH WATER,
Narvon Mining and Chemical Co., Lancaster, Pa.
W. Arthur Welch.
Water and Sewage Works, Vol 117, No 6, p 189-190, June 1970.

Descriptors: *Settling basins, *Lagoons, Pollution abatement, Sludge, Filtration, *Water treatment, Separation techniques.
Identifiers: *Washwater recovery, *Polyelectrolyte, Backwash cycle, Zeta Floc WA, Floc, Recovery basin.

In addition to the disposal of sludge from settling basins, the disposal of filter washwater is an important problem in water treatment plant pollution abatement. A polyelectrolyte, Zeta Floc WA, is stated to produce a dense floc when added to filter washwater during the backwash cycle. The coagulating chemical is fed dry to the waste water stream and is capable of producing an 80 to 85% washwater recovery when the waste is settled in lagoons or a recovery basin. Data for a typical backwash of 6 to 8 minutes with 60,000 gallons of water showed that 8 to 10 pounds of polyelectrolyte were required at a cost of $0.11 per pound. The sludge produced can be dewatered, recycled to the primary settling tanks, or utilized as a sewage sludge condition. (Nardozzi-AWWA)
W71-07468

THE NEW LANGFORD TREATMENT WORKS OF THE SOUTHEND WATERWORKS COMPANY.
Southend Waterworks Co.

Water and Water Engineering, Vol 74, No 894, p 319-327, Aug 1970. 12 fig, 1 tab.

Descriptors: *Construction, *Hydraulic design, Contracts, Chlorination, Hydrogen ion concentration, Filtration, *Water softening, Water works, Municipal water.
Identifiers: *Lime-soda softening, *Recycling, Prechlorination, Dechlorination.

The site, layout, foundation, administration, and plant specifications are described for a 12 million gallon per day lime/soda softening facility. In addition to the softening process, construction and hydraulic design considerations are outlined for the prechlorination, hydrogen ion concentration adjustment, gravity filtration, chlorination, and dechlorination processes. The lime/soda sludge is concentrated to 7000 gal/h and pumped at a rate of 3 1/2 feet per second through 4 inch PVC piping to a gravel pit. The sludge settles and the supernatant effluent from the pit is recycled to the plant intake line. Details are provided on the treated water pumping station and the architectural features of the utility. A history of the operating record of the Southend Waterworks Company is presented. A diagram of the water treatment processes and the site layout is included. (Nardozzi-AWWA)
W71-07469

THE ORLY WATERWORKS OF THE CITY OF PARIS.
Degremont, Rueil (France).
For primary bibliographic entry see Field 05D.
W71-07470

RECALCINING LIME SLUDGE PRODUCES MULTIPLE BENEFITS,
Water Department, St. Paul, Minn.
For primary bibliographic entry see Field 05D.
W71-07471

WATER TREATMENT PLANT WASTES DISPOSAL,
Orange County Sewer Districts, Orlando, Fla.
For primary bibliographic entry see Field 05D.
W71-07476

RESEARCH ON WATER TREATMENT PLANT WASTE DISPOSAL,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05D.
W71-07477

DISPOSAL OF WASTE WATER FROM WATER FILTRATION PLANTS,
Metcalf and Eddy, New York.
For primary bibliographic entry see Field 05D.
W71-07478

WASTE ALUM AND ACTIVATED CARBON SLUDGE SOLIDS REDUCTIONS METHODS,
Orange County Sewer Districts, Orlando, Fla.
For primary bibliographic entry see Field 05D.
W71-07480

DRINKING OF SULFATE-WATER BY CATTLE,
Nevada Univ., Reno.
For primary bibliographic entry see Field 05C.
W71-07555

5G. Water Quality Control

OPTIMAL PLANS FOR CAPACITY EXPANSION OF WATER-SUPPLYING FACILITIES,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 06A.
W71-07134

ENVIRONMENTAL CONSIDERATIONS IN THE RECYCLING OF HIGH TEMPERATURE WATER,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07161

PERMITS FOR DISCHARGES OR DEPOSITS INTO NAVIGABLE WATERS.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07211

GRANTS FOR WATER POLLUTION CONTROL.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07212

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07213

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07214

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.

Report of the Secretary of the Interior, Congress, S Doc No 91-58, 91st Cong, 2d Sess (1970). 633 p, 66 fig, 8 photo, 102 tab, 54 ref, 3 append.

Descriptors: *Estuaries, *Water pollution, *Water resources development, *Estuarine development, Gulfs, Oceans, Coasts, Bays, Rivers, Saline water-fresh water interfaces, Environmental effects, Environment, Federal government, Governments, Legislation, Social aspects, Legal aspects, Pollution

abatement, Water quality, Water pollution sources, Water pollution effects, Administrative agencies, Long-term planning, Estuarine fisheries, Federal-state water rights conflicts.

Pursuant to the Clean Water Restoration Act of 1966, the Secretary of the Interior herein presents a technical analysis of the estuarine zone, identification of scientific knowledge gaps, and an inventory of the available knowledge, all of which form the basis for the recommended comprehensive management program for the nation's estuarine resources. Included in the report are: (1) summary and conclusions of information leading to the recommended national program; (2) recommendations for a comprehensive program of estuarine development and management, including new legislation and suggested roles for government; (3) discussions with respect to technical management problems of the interaction between the biophysical and socioeconomic environment of the estuarine zone; (4) an evaluation of the institutional environment as it presently exists and recommendations for changes; (5) the development of data on the estuarine zone to provide the basis for sound technical management through rational institutional management; and (6) a description in general terms of the mass of reference materials from which the information in this report was derived. The active implementation of these recommendations will permit maximum use of the entire estuarine zone while preserving it for the benefit of future generations. (Smiljanich-Florida)
W71-07215

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07216

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
For primary bibliographic entry see Field 06E.
W71-07217

DISCHARGE OF OIL.
For primary bibliographic entry see Field 06E.
W71-07218

ENVIRONMENTAL EDUCATION ACT (NEED FOR EDUCATION CONCERNING ENVIRONMENTAL QUALITY AND ECOLOGICAL BALANCE).
For primary bibliographic entry see Field 06E.
W71-07219

LEGISLATION FACILITATING NEGOTIATION OF AN INTERSTATE COMPACT RESPECTING THE HUDSON RIVER.
For primary bibliographic entry see Field 06E.
W71-07220

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-07221

DETERGENT POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO ESTABLISH STANDARDS AND PROGRAMS TO ABATE AND CONTROL WATER POLLUTION BY SYNTHETIC DETERGENTS).
For primary bibliographic entry see Field 06E.
W71-07223

A BILL TO ASSIST THE STATES IN ESTABLISHING COASTAL ZONE MANAGEMENT PLANS AND PROGRAMS.
For primary bibliographic entry see Field 06E.
W71-07224

TURNING POINTS IN TIME--LAND/WATER/PEOPLE.
For primary bibliographic entry see Field 03F.
W71-07294

PUBLIC HEARINGS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W71-07308

STANDARDS-SETTING CONFERENCES, HEARINGS, AND NOTIFICATION OF ALLEGED VIOLATORS OF WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 06E.
W71-07354

SECOND SESSION OF THE CONFERENCE ON THE MATTER OF POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Federal Water Pollution Control Administration, Washington, D.C.

Proceedings of the Second session, Conference on Pollution of Lake Michigan and its tributary basin, Illinois, Indiana, Michigan, and Wisconsin, held Feb 25, 1969 at Chicago, Illinois. Vol 1: 364 p, 13 fig, 8 tab, 12 append; Vol 2: p 365-968, 1969. 20 fig, 14 tab.

Descriptors: *Conference, *Lake Michigan, *Water pollution sources, *Phosphorus, *Water pollution control, Tributaries, Municipal wastes, Industrial wastes, Waste treatment, Nuclear wastes, Thermal pollution, Ships, Chlorination, Dredging, Sediments, Soil erosion, Oil, Phenols, Electric powerplants, Insecticides, Agriculture, Flood plain zoning, Regulation, Monitoring, Harbors, Beaches, Watersheds (Basins), Pathogenic bacteria.
Identifiers: Watercraft wastes, Alewife, Oil spills.

The Second Session of the 1969 Conference on the Pollution of Lake Michigan heard representatives from the Corps of Engineers, Michigan, Indiana, Illinois, Wisconsin, Department of Agriculture, FWPCA, the 5th Army, and Navy on problems and solutions to water pollution, treatment, and elimination, including dredgings, disinfection, chlorine residues, municipal and industrial waste water treatment, soil erosion, flood plain control, economics, storm and waste water sewerage, diversion, interstate transportation of industrial wastes, federal-state concurrent jurisdiction, sampling, monitoring, watercraft and shipping wastes; pollution of marinas and beaches, law formulation and enforcement, shore disposal facilities, insecticides, interstate standards, programs for reducing sediment pollution and erosion damage. Also outlined were waste control and treatment in federal installations and shipboard disposal systems, uniform regulations on watercraft wastes, nuclear plant wastes, and thermal pollution standards, state water quality standards, utilization of thermal water, and alewife die-off. It was concluded that an average 80% reduction of phosphorus loadings into Lake Michigan can be achieved by 1972. (Auen-Wisconsin)
W71-07361

GENERAL MOTORS APPROACH TO WATER POLLUTION CONTROL,
General Motors Corp., Detroit, Mich.
G. N. Tiberio.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 440-446, Mar 1966. 3 fig.

Descriptors: *Water pollution control, *Waste water treatment, *Cost analysis, *Industrial wastes, Oily wastes, Toxicity, Incineration, Vacuum drying, Dewatering, Coagulation, Flotation, Hydrogen ion concentration.
Identifiers: Management attitudes, Plating wastes, General Motors Corporation.

The full scope of water pollution control at the 15 General Motors facilities is discussed, with particular attention to the past history of pollution control practices in the GM administrations. At present, no plants are discharging any effluents which violate pollution control statutes. However, future plans have already been made for further developments. These include: (1) design, construction and maintenance of treatment facilities will be presented to plant managements as being of equal importance with manufacturing facilities; (2) pollution control should become an integral part of the total unit production cost; (3) water re-use and chemical recovery processes should be much more extensively explored to determine which process can be utilized; and (4) better methods for control and treatment of plating and oil waste sludges are imperative. At the present time, vacuum filtration, flotation, coagulation, and final clarification are used for oily wastes, while treatment of plating wastes involves many of the same processes in a different arrangement. (Lowry-Texas)
W71-07370

FILING OF REPORTS WITH SECRETARY OF THE INTERIOR BY PERSONS WHOSE ALLEGED ACTIVITIES RESULT IN DISCHARGE CAUSING OR CONTRIBUTING TO WATER POLLUTION,
For primary bibliographic entry see Field 06E.
W71-07421

AN OPTIMAL SITING MODEL FOR THERMAL PLANTS WITH TEMPERATURE CONSTRAINTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
David H. Marks, and Richard A. Borenstein.
Available from Edison Electric Institute, 750 Third Avenue, New York, NY 10017 as EEI Pub No 70-902, Price $2.00. Cooling Water Studies for Edison Electric Institute, Research Project RP-49, Report No 6, Aug, 1970, Johns Hopkins University, Baltimore, Maryland.

Descriptors: *Thermal powerplants, Economics, Cooling water, Benefits, Costs, Area redevelopment, Input-output analysis, Project planning, Mathematical models, Temperature, Thermal pollution, *Optimization, Statistical models, Mathematical studies, *Optimum development plan, Sites, Temperature control, *Model studies.

Three models are presented for the optimal siting of thermal-electric generating stations. The models may be used as aids in making location decisions, particularly by showing the sensitivity of the models' optimal solution to changes in input parameters, and also by permitting the evaluation of costs associated with different siting policies and different temperature standards. The models presented are a zero-one integer programming model, a mixed integer programming model and a model with probabilistic temperature constraints. A working solution, type and format of input information, and a sample problem are presented. A general discussion of the economic aspects of an integrated power generating system and of questions relating to efficient utilization and growth of such a system is also presented. (Novotny-Vanderbilt)
W71-07423

PUBLIC WORKS FOR WATER, POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATION ACT, 1971.
For primary bibliographic entry see Field 06E.
W71-07434

EMERGENCY COMMUNITY FACILITIES ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-07435

UX DEVELOPMENT REGION IN SUB-ERGED JETS,
nois Univ., Urbana. Dept. of Civil Engineering.
r primary bibliographic entry see Field 08B.
1-07436

OLING TOWER FOG: CONTROL AND ATEMENT,
ernational Nickel Co. of Canada Ltd., Sudbury ntario).
nnie Veldhuizen, and Joe Ledbetter.
rnal of the Air Pollution Control Association, 21, No 1, p 21-24, Jan 1971. 1 fig, 2 tab, 21 ref.

scriptors: *Cooling towers, *Fog, Costs, Hu-lity, Water pollution control, *Pollution abate-nt, *Thermal pollution, Texas.
ntifiers: Control methods, Superheating, mes, Air cleaning, Houston (Tex).

gs from cooling towers are causing an increasing nber of visibility problems in addition to icing of ds, sidewalks, powerlines, etc. during freezing ather. This paper summarizes a study made to ertain the best method of fog control or abate-nt at a refinery in Houston, Texas. The induced ft, counterflow cooling towers of concern have ign capacities of 750 million and 225 million /hr under local climatic conditions. Wherever sible, preliminary capital, installation, and rating costs for all the alternatives were ob-ed and summarized in a table. The most nomical solution for this particular problem is nload the cooling tower for the estimated 150 rs a year either by disposing of or storing the water. Complete control by altering the heat hange mechanism is possible but the costs are rbitant. Dry towers which are being considered prevent fogging, are very expensive. For new ling towers, its location is recommended as a important factor. (Upadhyaya-Vanderbilt)
1-07437

TERSTATE COMMISSION ON THE TOMAC RIVER BASIN--COMPACT.
primary bibliographic entry see Field 06E.
1-07440

RVEY SHOWS NUCLEAR PLANTS WILL MIT POLLUTING EFFLUENTS,
ert G. Schwieger.
ver, Vol 115, No 1, p 49-53, Jan 1971. 3 tab.

scriptors: *Nuclear powerplants, *Thermal pol-on, Cooling water, Cooling towers, Environ-ntal effects, Water pollution control.
ntifiers: Heat dissipation, Heat utilization.

ummary is presented of the operational parame-of some 34 nuclear power plants in the United es and some 16 nuclear power plants overseas. oling parameters are determined with indication the thermal effects study will be undertaken in out of 34 cases in the United States. To limit the sibility of adverse effect on the environment, eral utilities will have cooling towers or ponds; ers will employ a variety of techniques for dly dispersing the heated effluent in the water-rse. Two ways to achieve good mixing are used: erforated condenser discharge pipe extending into a watercourse-like that at TVA's Brown ry-and a system of weirs to rapidly dilute warm uent. While utilities find ways to dissipate heat, ctor vendors are looking into methods for using eneficially to: (1) provide hot water for urban ting and absorption air conditioning systems (2) to increase rate and effectiveness of sewage tment processes. (Oleszkiewicz-Vanderbilt)
1-07451

SQUEHANNA RIVER BASIN COMPACT.
primary bibliographic entry see Field 06E.
1-07453

A BILL TO PROVIDE FOR THE CONTROL AND PREVENTION OF POLLUTION, DETERIORATION OF WATER QUALITY, AND DAMAGE TO LANDS AND WATERS RESULTING FROM EROSION TO THE ROADBEDS AND RIGHTS-OF-WAY OF EXISTING STATE, COUNTY, AND OTHER RURAL ROADS AND HIGHWAYS.
For primary bibliographic entry see Field 06E.
W71-07482

MARINE POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 06E.
W71-07483

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W71-07484

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FINANCIAL ASSISTANCE FOR RIVER BASIN PROGRAMS.
For primary bibliographic entry see Field 06E.
W71-07485

POLLUTION AND THE LAW IN ILLINOIS,
For primary bibliographic entry see Field 06E.
W71-07486

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-07492

THE LAW OF WATER USAGE,
For primary bibliographic entry see Field 06E.
W71-07493

OIL POLLUTION OF COASTAL AND INLAND WATERS OF THE UNITED STATES UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970,
For primary bibliographic entry see Field 06E.
W71-07494

PROTECTING OUR ENVIRONMENT AND NATURAL RESOURCES IN THE 1970's,
Allen V. Kneese.
Resources for the Future, Inc, Washington, DC, Reprint No 88, August 1970. 8 p, 1 ref.

Descriptors: *Water pollution control, *Environmental sanitation, *Economic efficiency, *Federal project policy, Federal government, Effluents, Economic feasibility, Economic justification, Economics, Natural resources, Environmental engineering, Grants, Taxes, Water quality control, Water pollution treatment, Administration, Regional analysis, Legal aspects, Cost allocation, Coordination, Political constraints, Legislation, Interstate commissions, Interstate compacts, Non-structural alternatives.
Identifiers: *Effluent charges, Federal Water Pollution Control Act.

This reprint of a statement before the House Subcommittee of the Committee on Government Operations examines environmental pollution problems from an economic perspective, and outlines a proposed water pollution control strategy. The inadequacy of governmental subsidies and technological fixes increases the importance of managing the environment in terms of 'common property resources'. The author rejects existing federal water pollution control strategy based on municipal waste treatment grants under the Water Pollution Control Act of 1956 and state water quality standards, imposed by the Water Pollution Control Act of 1965. The inadequacy of this strategy stems from: (1) lagging appropriations, (2) ineffective enforcement, and (3) poor coordination. Industrial tax incentives are also rejected as economically ineffective. An effluent charges system, coupled with regional management, is economically superior to other plans because: (1) effluent charges require payment for resource use, (2) subsidies provide no inherent incentives, (3) subsidies bias technique selection, and (4) effluent charges produce revenue. A national effluent charge would avoid local political pressures. Federal leadership establishing interstate management appears more practical than direct federal administration as a means of obtaining regional management efficiency. (Earl-Florida)
W71-07495

ECONOMIC ANALYSIS OF SEWER SERVICE CHARGE FORMULAS,
McMasters Univ., Hamilton (Ontario). Dept. of Economics.
For primary bibliographic entry see Field 06C.
W71-07502

FINAL REPORT OF THE TECHNICAL COMMITTEE ON STORM OVERFLOWS AND THE DISPOSAL OF STORM SEWAGE,
J. T. Calvert.
Inst Civil Engrs (London), Vol 47, p 305-308, Oct 1970.

Descriptors: *Sewage disposal, Costs, Water pollution sources, Sewers.
Identifiers: *Storm overflows, Great Britain.

An informal discussion on the Committee's findings shows that: (1) the abolition of all storm overflows was not recommended because the enormous cost could not be justified and pollution from surface water sewers could still occur; and (2) a new formula, in which the amount of sewage to be contained in the system downstream of the overflow would vary only slightly with water consumption and the formula would broadly ensure the polluting matter from each person was diluted by a fixed amount of rainwater before spill commenced, were recommended.
W71-07519

COMBINED SEWER REGULATOR OVERFLOW FACILITIES.
American Public Works Association, Chicago, Ill.

FWQA Contract No 14-12-456, Program No 11022DMU, Jul 1970. 139 p, 38 tab, 4 append.

Descriptors: *Overflow, *Regulation, Design, Operations, Maintenance, Control systems.
Identifiers: *Combined sewers, Tide gates, Overflow quantity, Overflow quality.

Current design, operation, and maintenance practices used by local jurisdications in the United States and Canada were determined by personal interviews and compiled in this report. Particular attention was given to the performance of various types of regulators, the use of tide gates, new designs, European practices, and the systems concept of combined sewer regulation. Thirty-seven drawings and photographs of regulators are included. 17 recommendations are made, the adoption of which would upgrade regulator facilities and tend to reduce receiving water pollution from combined sewer overflows.
W71-07520

METROPOLITAN BOSTON'S WASTE WATER QUALITY CONTROL PROGRAM.

Water Sewage Works, Vol 117, No 9, p 300-304, Sep 1970.

Descriptors: *Water pollution sources, *Overflow, *Legislation, *Treatment facilities, Pollution abatement, Water quality control, Massachusetts.
Identifiers: *Storm overflows, *Boston (Mass).

This paper traces the historical factors contributing to the sewage problems in Boston, Massachusetts and accredits the general causes for the pollution conditions to: (1) the raw sewage discharge into Boston Harbor, and (2) mixed sewage and storm water overflow into tributary rivers, streams, and basins. Pertinent sections of legislation authorizing pollution control construction as well as associated legislative acts are mentioned. A description of existing sewage treatment plants and important features of the improvement programs is given. A new anti-pollution installation on the Charles River, expected to be undergoing acceptance and evaluation tests in late 1970, will accumulate, detain, and chlorinate overflow from combined sewage and surface drainage occurring during heavy storms.
W71-07521

THE CARDIFF EASTERN DISTRICT DRAINAGE SCHEME,
S. R. Salt.
Inst Munic Engrs, London, Vol 97, No 9, p 246-254, Sept 1970. 8 fig, 2 ref.

Descriptors: *Sewerage, *Sewers, *Planning, *Drainage systems, Treatment facilities.
Identifiers: *Great Britain.

The area around Cardiff, Wales is serviced by three sewerage systems which have continued in use from the latter half of the 19th century until recently, with only one major change, despite expansion of the city. It was clear that a major renewal was required if further development on the east side of the city was not curtailed. The new plans would: (1) eliminate three storm overflows, (2) ensure far off-shore discharge, (3) provide for the screening of the total flow, and (4) maintain existing sewers. Thus the scheme, which is detailed herein, would include two runs of duplication sewers, a new pumping station, and a new sea outfall.
W71-07526

EFFECT OF RAIN COLLECTING BASINS ON THE YEARLY INFLUX OF POLLUTANTS INTO A SEWER MAIN: FUNDAMENTALS OF DIMENSIONING COLLECTING BASINS,
Walter Munz.
Gas-Wasserfach, Vol 109, No 30, p 823-827, July 26, 1968. 4 fig, 1 tab, 8 ref.

Descriptors: *Sewers, *Infiltration, *Water pollution sources, Mathematical studies.
Identifiers: *Collecting basins.

The International Water Protection Commission for Lake Constance was faced with the question of the magnitude of the effect of an individual measure on the yearly influx of pollutants into the sewer main. To provide an answer, the author worked out a procedure for computations of material flows for different combinations of measures of differing effectiveness under given conditions. Such computations were carried out at the Zurich Technical University and the Baden-Wurttemberg Hydrological Administration. The results of the computations relating to the elimination of BOD by various combinations of pertinent measures are presented in graphs and briefly discussed. The author also presents a systematic classification of all possible kinds of rain collecting basins according to basin type and the relative altitude of the basin outlet with respect to its inlet.
W71-07527

STORM-WATER RETENTION CAN WORK...AND PREVENT THE HEAVILY POLLUTED 'FIRST FLUSH' FROM OVERFLOWING TO DAMAGE THE RECEIVING RIVER,
Gerald Remus.
Am City, Vol 85, No 10, p 68-69, Oct 1970. 2 fig.

Descriptors: *Storm runoff, *Sewers, *Monitoring, *Control systems, Sewerage, Data collections, Michigan, Waste water treatment, Water pollution control.
Identifiers: *Detroit (Mich), *Overflow abatement.

An intense thunderstorm over Detroit, Michigan dropped about one billion gallons of water with about 450 million gallons entering the sewer system that processed 365 million gallons in excess of average flow during the following 30 hours. The system retained so much storm water that the overflow outfalls, which normally discharge into the Detroit and Route Rivers, had very little to do. The sewer monitoring and remote control system, briefly discussed, efficiently compiled rainfall and sewer-level data every five minutes.
W71-07530

PRECAST, REINFORCED CONCRETE MEMBERS IN THE CONSTRUCTION OF WATER SUPPLY AND SEWERAGE SYSTEMS,
V. I. Lerner, and I. S. Chumakov.
Beton i Zhelezobeton, No 2, p 8-10, Feb 1970.

Descriptors: *Construction materials, *Concrete construction, Sewerage, Water pollution control.
Identifiers: *Water supply systems, *Sewerage systems, *USSR.

The construction of sewers and water supply tunnels made of large dimensional and relatively thin-walled reinforced concrete components has been experimented with by the Soviets. The methods of construction of reinforced concrete waterproof wall panels for rectangular and round vessels are discussed.
W71-07537

PHOTOGRAPHY AND OTHER REMOTE SENSING OF WATER POLLUTION,
R. K. Lane.
Water Pollution Control, Vol 108, No 9, p 20-21, Sept 1970.

Descriptors: *Photography, *Data collections, *Remote sensing, Effluents, Pollutants.
Identifiers: Water pollution studies.

Photography has long been used as a remote sensing tool for environmental data collection from aircraft. In water pollution studies most interest is centered around the need for observing the behavior of effluents which introduce pollutants to rivers or lakes. Qualitative examinations of effluents through photography can be useful to locate effluents, to determine how their behavior is affected by local characteristics, ambient flow rates, and meteorological conditions, and to determine relative intensities of discharges. Techniques for quantitative assessments of polluted discharges are not yet operationally effective.
W71-07538

ANIMAL WASTE REUSE--NUTRITIVE VALUE AND POTENTIAL PROBLEMS FROM FEED ADDITIVES--A REVIEW.
Agricultural Research Service, Beltsville, Md. Animal Science Research.

ARS 44-244, Feb 1971. 56 p, 3 tab, 184 ref.

Descriptors: *Farm wastes, *Additives, *Feeds, Ruminants, Poultry, Cattle, Diets, Hazards, Hogs, Biodegradation, Pathogenic bacteria, Larvicides, Pest control, Organophosphorus, Nutrients.
Identifiers: *Literature review, *Residues, Swine, Hormones, Antibiotics, Disease control, Growth adjuvants, Excretion data, Registration, Non-nutritive.

This is a report of literature on the nutritional value of animal wastes and the potential problems that may occur when compounds other than nutrients are added to animal feed. The non-nutritive feed additives discussed are as follows: Pellet binders, flavoring agents, enzymes; Antibiotics, arsenicals, nitrofurans, (low level feeding); Antifungals, lar
cides; Broad-spectrum, absorbable antibiot
(high level therapeutic use); Chemicals used
potentiate curative properties of antibiotics; Co
cidiostats, worming drugs, antioxidants; Caro
noid sources, hormones; Reserpine, aspirin, a
tranquilizing drugs. (See also W71-07543 th
W71-07547) (White-Iowa State)
W71-07542

**FECAL RESIDUES FROM FEED ADDITIVE
POULTRY,**
Agricultural Research Service, Beltsville, M
Animal Science Research.
C. C. Calvert.
In: Animal Waste Reuse--Nutritive Value a
Potential Problems from Feed Additives
Review. ARS 44-224, p 14-19, Feb 1971.

Descriptors: *Additives, *Feeds, *Poultry, Fa
wastes, Pollutants, Diets, Hazards, Water polluti
Identifiers: Antibiotics, Arsenicals, Nitrofura
Growth adjuvants, Soil pollution.

To keep pace with the increased demand for e
and poultry meat, the feed manufacturers
producers have used more and more feed additi
There is a concern with what these additives
contribute to air, soil, and water pollution a
they have performed whatever function they
have in the animal body. The nonnutritive feed
ditives commonly found in poultry feed
discussed. These include pellet binders, flavo
agents, enzymes, antibiotics, arsenicals,
nitrofurans; antifungal agents, coccidiostats
worming drugs, antioxidants, carotenoid sour
hormones, reserpine, aspirin and tranquili
drugs are being added to poultry feeds. (See
W71-07542) (Christenbury-Iowa State)
W71-07543

FEEDING VALUE OF ANIMAL WASTES,
Agricultural Research Service, Beltsville,
Animal Science Research.
L. W. Smith.
In: Animal Waste Reuse--Nutritive Value
Potential Problems from Feed Additives
Review. ARS 44-224, p 5-13, Feb 1971. 1 tab.

Descriptors: *Feeds, *Ruminants, Algae, Ca
Poultry, Hogs, Animal diseases, Catfish, W
treatment, Farm wastes, Dehydration, Feasibili
Identifiers: *Animal manure, *Literature rev
Feeding value.

This paper reviews the literature concerned
feeding animal waste to livestock. Fiber in diet
ruminants is not digested to the maximum pos
extent during the initial pass through the dige
tract. Other nutrients also escape digestion. F
ing feces is not a new concept. Early in the 19
cow manure was looked upon as a source o
complex vitamins. Poultry and catfish have
successfully fed rations containing feedlot man
There have been many articles concerning the
of poultry litter in ruminant feeding progr
Feeding poultry feces to poultry was reporte
have no adverse effect on bird mortality or
taste. Algae grown on sewage has been fed to
The authors indicate that algae is a potentially
able livestock feed. (See also W71-07
(Christenbury-Iowa State)
W71-07544

**FECAL RESIDUES FROM FEED ADDITIV
SWINE,**
Agricultural Research Service, Beltsville,
Animal Science Research.
L. T. Frobish.
In: Animal Waste Reuse--Nutritive Value
Potential Problems from Feed Additive
Review. ARS 44-224, p 19-27, Feb 1971.

Descriptors: *Additives, *Hogs, *Feeds,
wastes, Hazards, Pollutants, Growth rates, Diet
Identifiers: Swine, Diethylstilbestrol.

s paper discusses the major feed additives as-
iated with swine production. They are: an-
itics, arsenicals, copper, nitrofurans, sulfona-
es and hormones. Many compounds have been
l for the treatment of specific diseases in swine
when incorporated into the diet at low levels
have growth promoting properties. There is lit-
available information on the metabolites of an-
otic degradation, their excretion, and possible
ribution in the soil and finally into plants. Ar-
lic acid is the most common arsenical com-
nd used in swine diets. There is very limited
on excretion of many of the additives and their
equent effect on the environment. (See also
1-07542) (Christenbury-Iowa State)
1-07545

**AL RESIDUES FROM HORMONES AND
TIBIOTICS--BEEF CATTLE,**
cultural Research Service, Beltsville, Md.
nal Science Research.
. Dinius.
Animal Waste Reuse--Nutritive Value and
ntial Problems from Feed Additives--A
iew. ARS 44-224, p 27-32, Feb 1971.

criptors: Farm wastes, Cattle, Feeds, Diets,
radation (Decomposition), Biodegradation.
tifiers: *Hormones, *Antibiotics, Disease con-
Concentrations, Implant, Excretion data.

interest in hormones excreted by animals
h may be recycled through plants and back to
or animals is with the natural and synthetic es-
ens, androgens, and progestins. This discussion
s only with these. Other hormones, such as fol-
stimulating hormone and luteinizing hormone,
be present in animal excreta but they occur in
l concentrations and are readily biodegrada-
thus, they are of little ecological concern. Cer-
antibiotics are frequently added to the high-
n ratios commonly fed to finishing beef cattle.
view summarizing some of the research that
been conducted with these antibiotics, particu-
in reference to the potential for recycling
ugh feedstuffs is presented. Plants will not ab-
from the soil measurable quantities of the an-
tics commonly fed to cattle. (See also W71-
42) (Christenbury-Iowa State)
-07546

**AL RESIDUES FROM LARVICIDES--
LTRY AND CATTLE,**
cultural Research Service, Beltsville, Md.
nal Science Research.
. Miller.
in Bulletin of the Entomological Society of
rica as Larvicides for Fly Control - A Review,
.. W. Miller, Vol 16, No 3, p 154-158, Sept
. In: Animal Waste Reuse--Nutritive Value
Potential Problems from Feed Additives--A
ew. ARS 44-224, p 33-41, Feb 1971. 2 tab.

riptors: *Farm wastes, *Larvicides, Larvae,
ogenic bacteria, Boron, Organophosphorus,
cides, Cattle, Poultry, Feeds, Pesticide
ues, Pest control.
ifiers: Fly larvae, Feed additives, Residues, Fly
rol, Animal manures, Registration.

of the best methods for control of flies is
ugh the use of larvicides, applied either directly
e manure, or as a feed additive. Research was
ucted as early as 1928 on feed additives to
the feces unfavorable for the development of
fly larvae. In 1954, organophosphorus insecti-
began receiving a great deal of attention as
ble feed-additive larvicides for the control of
around both poultry and cattle operations.
ough a great deal of research has been con-
ed on find suitable feed-additive larvicides for
ntrol around poultry and cattle manure, no in-
cides are registered for commercial feed-addi-
se with poultry and only one has a registration
se with lactating dairy cattle. Three insecti-
have registrations for feed-additive use with
cattle. (See also W71-07542) (Christenbury-
State)
-07547

**AGRICULTURAL WASTE IN AN URBAN EN-
VIRONMENT.**
New Jersey Animal Waste Disposal Task Force.
For primary bibliographic entry see Field 05D.
W71-07552

**RIVER BASIN AUTHORITIES: A NATIONAL
SOLUTION TO WATER POLLUTION,**
Harvard Univ., Cambridge, Mass.
Marc J. Roberts.
Harvard Law Review, Vol 83, p 1527-1556, May 1970.

Descriptors: *Water pollution control, River basin commission, Pollution abatement, Waste treatment facility, Economic efficiency, Resource allocation, Streamflow, Investment credit.
Identifiers: *Effluent charge, Subsidy, Equity, Social cost, Tax incentive.

Some reforms suggested for water pollution control are analyzed and a new approach to water pollution abatement is proposed. The most prevalent suggestion to stimulate private pollution control investment has been the use of tax incentives usually through accelerated depreciation or some form of investment credit. The author finds that proposed tax incentives are too small to generate much business response and moreover tend to shift funds away from least-social-cost approaches such as chemical treatment or land-intensive procedures. Finally, industrial incentives or subsidized municipal treatment of industrial wastes shifts the cost of pollution to the government with resulting economic misallocations. The author suggests the formation of strategically located federal river basin authorities to control and conduct all pollution abatement activity. With federal funding for treatment of domestic wastes and efficient service charges for treating industrial effluent, the basin authority is an equitable and efficient method of meeting water quality standards. (Siegenthaler-Rutgers)
W71-07559

A THREE STEP APPROACH TO POLLUTION REVERSAL,
Oregon Univ., Eugene.
For primary bibliographic entry see Field 06B.
W71-07563

WATER QUALITY CONTROL PRACTICES ON THE GREAT LAKES,
Ontario Water Resources Commission, Toronto.
J. R. Barr, and A. C. Priatz, Jr.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Power Commission of Ontario, p 393-417, 1968.

Descriptors: *Great Lakes, *Water quality, *Pollution, *Water resource development, Waste treatment, Water management, River basins, Sewage, Watersheds, Lakes, Government, Capital costs, Financing, Planning, Sewers, Pesticides.
Identifiers: *Education, *Water Quality standards, Bond financing.

Water quality control practices on the Great Lakes are considered in two sections, namely the Canadian and United States practices. The Canadian section indicates that historical water quality control practices point to a need for new objectives to insure the long-term water quality of the Great Lakes. However, it is then indicated that such new actions, particularly pollution control, call for mass education of municipalities, industry and the public for financial program support of activities which do not yield an immediate self-benefit. The American section, on the other hand, indicates that water quality control practices are constantly undergoing improvement in response to concern on the part of the public in favor of a preventive approach to pollution. The author also cites improved co-ordination between responsible branches of government as another recent trend in water quality control, particularly as seen in the uniform laws of the Water Quality Standards Programme and State-wide treatment of waste and water management. Such current trends are presented as indications that water resources will be optimally preserved for future use. (See also W71-07565) (Murphy-Rutgers)
W71-07575

ORGANIZATION AND PLANNING OF WATER QUALITY CONTROL,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 06B.
W71-07576

EFFLUENT CHARGES: A METHOD OF ENFORCING STREAM STANDARDS,
Maine Univ., Orono.
For primary bibliographic entry see Field 06C.
W71-07577

SOURCE CONTROL OF URBAN WATER POLLUTION,
Florida Univ., Gainesville. Dept of Engineering and American Public Works Association, Chicago, Ill. Technical Services.
James P. Heaney, and Richard H. Sullivan.
Journal Water Pollution Control Federation, Vol 43, No 4, p 571-579, Apr 1971. 9 p, 1 fig, 9 tab, 14 ref.

Descriptors: *Water pollution sources, *Cities, *Urbanization, *Storm runoff, *Water pollution control, Water pollution effects, Pollutant identification, Illinois, Runoff, Storm drains, Sewage, Sewers, Water quality, Water management (Applied).
Identifiers: *Urban runoff, *Urban hydrology.

An exploratory study was undertaken to obtain a 'solids budget' of urban runoff within a 10-acre area in Chicago, Ill. The sources investigated included air pollution, sanitary wastes, garbage, and miscellaneous solids. The source controls examined were catch basin cleaning, sewer cleaning, and street sweeping. Unit costs of street sweeping indicate that catch basins and their cleaning, along with subsequent sewer cleaning, make them undesirable. Garbage grinders are also a likely possibility for reduced use or outlawing. (Knapp-USGS)
W71-07642

POLLUTION CONTROL AT A MAJOR OIL SPILL,
Union Oil Co. of California, Los Angeles.
T. H. Gaines.
Journal Water Pollution Control Federation, Vol 43, No 4, p 651-667, Apr 1971. 17 p, 1 fig, 1 tab, 1 ref, 4 append.

Descriptors: *Water pollution control, *Oily water, *Oil fields, *California, *Water pollution treatment, Reviews, Water pollution effects, Cleaning.
Identifiers: *Oil spills, *Santa Barbara (Calif).

The paper is a comprehensive report on the efforts made to limit the pollution effects of the Santa Barbara oil spill of January 28, 1969. The use of polyelectrolytes and dispersants is reviewed. Application techniques and their effectiveness are discussed. The role of the Federal Water Quality Administration in the occurrence is included. Containment of the oil side with a boom was unsuccessful. An attempt was made to use booms to protect the shoreline, but heavy seas prevented their use. After the beaches were inundated with oil, cleanup efforts were started with a peak labor force of 1,000 men. Over 30,000 tons (27,000 metric tons) of storm debris were cleaned up. A system of containment for undersea seepage is described. A complete equipment list and progress report is included in the paper. (Knapp-USGS)
W71-07644

COOLING TOWERS,
Black and Veatch, Kansas City, Mo.
Riley D. Woodson.

Scientific American, Vol 224, No 5, p 70-78, May 1971. 9 p, 8 fig, 1 tab.

Descriptors: *Cooling towers, *Cooling water, *Industrial water, *Engineering structures, *Heated water, Thermal pollution, Structures, Structural design, Construction, Reviews, Cooling, Heat transfer, Recirculated water, Methodology.

Hot water carrying waste heat from a large industrial installation such as a powerplant is often best handled by a tower that breaks the water up, cools it in a cross draft of air and then recirculates it. Four types of towers are depicted schematically. 1. The atmospheric tower, which was one of the earliest types of cooling tower, relied on natural winds and the aspirating effect of the spray nozzles to provide cooling air. 2. The mechanical-draft crossflow tower, which is the kind in widest use at present, has a fan at the top to draw air in through the louvers, across the path of the falling water and out of the stack. 'Fill' is the material that breaks up water into fine droplets; the drift eliminators retard the movement of water out of the stack with the departing air. 3. The mechanical-draft counterflow tower is similar except that the air moves vertically upward through the falling water. 4. The hyperbolic natural-draft tower has no fan; the draft results both from the height of the structure and the difference in density between the warm, moist air inside the tower and the colder, denser air outside. Discharge is far above ground. (Woodard-USGS)
W71-07645

IMPROVED METHODS FOR PLANNING OF THERMAL DISCHARGES BEFORE SITE ACQUISITION,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
R. T. Jaske.
Atomic Energy Commission Research and Development Report, BNWL-SA-2737 17 p, Dec 1969. 6 fig, 9 ref.

Descriptors: *Thermal pollution, *Water temperature, *Powerplants, Model studies, Water quality, Standards, Optimization, *Sites, Water pollution control.
Identifiers: *COLHEAT simulation model, Thermal discharge.

The most significant factors for site selection of a powerplant are thermal effluent considerations, existing transmission system, plant size, environmental impact, and consumer requirements. To relate steam temperature modification with optimum public utilization Battelle Northwest developed COLHEAT, a deterministic one-dimensional temperature prediction system. This system describes the thermal regimen of a river or estuary and permits advance estimates of thermal effects of impoundments, single thermal plants or an extended series of thermal and hydro installations with overlapping effects on a single or regionally combined watershed. This paper reviews the basic algorithm employed and the rationale behind this approach. It is concluded that simulation modelling is fully capable of handling most of the potential siting problems which involve joint public and private use of thermal cooling resources. (Upadhyaya-Vanderbilt)
W71-07668

SHELL FIRE DYING PEACEFULLY,
Shell Oil Co.
Ken Edmiston.
Ocean Industry, Vol 6, No 3, Mar 1971.

Descriptors: *Oil wells, *Leakage, *Burning, *Chemicals, *Absorption, Oily water, Oil wastes.
Identifiers: Bay Marchand field blowout.

Containment and cleanup operations at Shell's field blowout in Marchand Bay are reported. Relief wells and various kinds of floating vessels, booms, chemicals and absorbents were used successfully in spite of the high seas, fog and prolonged southern winds. Casing cutting, killing the wells and the equipment used in all the operations are described in detail. (Ensign-PAI)
W71-07669

A SURVEY OF THE PROBLEMS AND RESEARCH NEEDS IN THE COASTAL ZONE,
Old Dominion Univ. Research Foundation, Norfolk, Va.
For primary bibliographic entry see Field 02L.
W71-07673

WATER RESOURCES ACTIVITIES IN THE UNITED STATES-POLLUTION ABATEMENT.
For primary bibliographic entry see Field 06E.
W71-07674

DETOXICATION OF SIMAZINE BY MICROSCOPIC ALGAE,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Selskokhozyaistvennoi Mikrobiologii, Leningrad.
Yu V. Kruglov, and L. N. Paromenskaya.
Trans from Mikrobiologiya, Vol 39, No 1, Jan-Feb 1970. Microbiology, Vol 39, No 1, p 139-142, 1970. 1 fig, 2 tab, 10 ref.

Descriptors: *Herbicides, *Pesticides, *Algae, *Toxicity, Soils, Triagine pesticides, Resistance, Cultures, Metabolism.
Identifiers: *Simazine, *Detoxication, Chlorosarcina, Ankistrodesmus braunii, Chlorella vulgaris.

Inoculation of simazine-treated soils with a culture of Chlorosarcina sp suggested a decrease in toxicity of the herbicide, the process being partly influenced by direct solar radiation. The chemical absorbed by Chlorosarcina and Ankistrodesmus braunii was partly metabolized by cells and formed some physiocochemical bond with protein. As shown by C-14 analyses, the strength and nature of this bond vary with the species of algae. Cells of Chlorosarcina, resistant to simazine, retained considerably greater amount of the chemical than did the cells of Ankistrodesmus, sensitive to the herbicide. (Wilde-Wisconsin)
W71-07675

REMOVAL OF COLOR FROM THE WATER OF WAIKOLOA STREAM SOUTH KOHALA DISTRICT, ISLAND OF HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W71-07680

THE USE OF TAXES, SUBSIDIES, AND REGULATIONS TO EFFECT AN IMPROVED ALLOCATION OF WATER RESOURCES,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 06E.
W71-07686

THE SANITARY HISTORY OF CHICAGO,
Henry W. Thurston.
Chicago, Circa 1899-1903. 50 p.

Descriptors: *Water pollution effects, *Diseases, *Epidemics, *Mortality, *Water quality, *Municipal wastes, *Municipal water, *History, *Public health, *Environmental sanitation, *Sewers, *Inspection.
Identifiers: *Chicago, *Sanitary history of Chicago, *Chicago Board of Health.

The author discusses the health problems and diseases prevalent in the City of Chicago from the 1830's to 1900 and relates these to public ignorance of, and unconcern for, sanitation. The average life-span of a Chicagoan in 1872 was 15 years, 2 mos., 10 days. Of 1,826 Chicagoans who died in 1859, 1,070, almost 57%, were under five years old. The high death rates of certain years were associated with epidemics of cholera, smallpox, diptheria, typhoid, erysipelas, scarlet fever, dysentery, and others. A Board of Health, consisting of three members, was provided for by the charter when Chicago became a city in 1837. The erratic operation and existence of the Board is discussed. The total expenditures of the Board in 1851 were $2,131.52, including salaries. The development of a sewer system and a water system together with filling low-lying areas to raise the ground elevation to facilitate gravity flow of sewers, is discussed. Discharge of sewage flows into the Chicago River and Lake Michigan and the use of Lake Michigan and shallow wells as sources of drinking water is described. The actions of city officials in instituting municipal sanitation measures are discussed. Included are sewers, water system, garbage collection, vaccination, burials in regulated cemeteries, stockyards regulations, and inspection of meat, milk, housing and smoke. The most detailed discussions of the article concern sewers. (Poertner-Chicago)
W71-07696

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.

US Dept of Interior, Federal Water Pollution Control Admin, Conference on Pollution of Interstate Waters of Lake Champlain and Its Tribuary Basin New York - Vermont, 1969. 378 p.

Descriptors: *Water pollution control, *Conferences, *Lakes, *Governments, Federal government, New York, Vermont, Lake basins, Lakebeds, Water pollution, Water pollution sources, Water pollution effects, Pollution abatement, Industrial wastes, Statistics, New England, Water pollution treatment, Lake soils, Economics, Law, fisheries, Standards, Impaired water quality, Recreation, Dissolved oxygen, Fishing, Eutrophication.
Identifiers: *Federal Water Pollution Control Act, Water quality criteria.

The Conference was convened pursuant to paragraph 10 of the Federal Water Pollution Control Act to deal with the problem of pollution of Lake Champlain. Federal, New York, and Vermont agencies were represented. The geography and characteristics of the lake basin were discussed in detail. The major area of pollution is toward the southern end of the lake, especially around a large paper factory at Ticonderoga. Specific problems such as sludge deposits, decreased oxygen supply, effect on fishing and recreation, and thermal pollution were discussed. Detailed statistical evidence of the extent of the water pollution was presented and reports were made on the water quality criteria of New York and Vermont. Findings and conclusions were reached on the nature and extent of the pollution problem and remedial measures to be taken. Emphasis was placed on standardizing efforts by New York and Vermont in dealing with with water pollution. (Caldwell-Florida)
W71-07697

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME I, THE LONG RUN EFFECTS OF WATER PRICING POLICIES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Marshall Gysi.
Available from the National Technical Information Service as PB-198 440, $3.00 in paper copy, $0.65 in microfiche. Technical Report No 25, Mar 1970. 322 p, 54 fig, 14 append, 32 ref. OWRR Project A-1640 (No 3151) (1).

scriptors: *Water rates, *Dynamic programming, *Optimum development plans, onomic efficiency, Municipal water, Water pol-, Pricing, Water supply.
entifiers: *Capacity expansion.

part of a sequence of studies utilizing optimiza- and simulation techniques to analyze a variety metropolitan water resource problems, this dy was concerned with the long term effects of sently used and alternatively proposed water cing policies. A discrete deterministic dynamic gramming model was structured and solved to termine the optimal water supply capacity ex- sion paths for a hypothetical and actual tropolitan community. Demand curves, popula- sizes and growth rates for various economic tors of the community were specified, as well as rt run production and capital construction ts. The objective of dynamic programming del was the maximization of future discounted sumers' surpluses plus producer's revenues net the long run cost of supply. State variables were MGD of system capacity and state variables re the years that the feasible capacity increases. e model was structured so that social ferences or weights could be attached to the efit or loss functions of any economic sector, to ck their effect on overall results. Several poli-, including flat rates, constant rate, decreasing increasing block rates and summer differential es were tested. The sensitivity of varying count rates, growth rates and patterns, capacity rement size and timing, and planning horizons examined. It was concluded that price plays a jor role in the long run planning and conserva- of water supplies. (See also W71-07060) iss-Cornell)
1-07059

UDIES IN THE ANALYSIS OF TROPOLITAN WATER RESOURCE STEMS, VOLUME II, RESERVOIR REGULA-ON: SOME TECHNIQUES AND RESULTS,
rnell Univ., Ithaca, N.Y. Water Resources and rine Sciences Center.
she Gablinger.
ailable from the National Technical Information vice as PB-198 441, $3.00 in paper copy, $0.95 nicrofiche. Technical Report No 26, Mar 1971. p, 40 fig, 13 tab, 5 append, 33 ref. OWRR Pro- C-1640 (No 3151) (2).

scriptors: *Reservoir operation, *Dynamic programming, *Stochastic processes, *Optimization, alytical techniques, Multiple-purpose reservoirs. ntifiers: Targets, Operating policies.

part of a sequence of studies utilizing optimiza- and simulation techniques to analyze a variety metropolitan water resource problems, this ly was concerned with the efficient operation of sting reservoir systems subjected to both serially cross correlated random inflows. This study ex- ned the multi-purpose use of single and two rvoir in series systems. For linear loss function as shown that the optimal yearly operation rule a single reservoir was independent of inflow upstream and downstream reservoirs. How-, the optimal operation of upstream reservoirs function of the inflow distribution into up- am and downstream reservoirs. Both analytical computational results were discussed. The lts presented, while limited, indicated both the antage and difficulties to be expected in extend- the methodology to larger river basin systems. e also W71-07059) (Kriss-Cornell)
1-07060

APPROACH TO RESERVOIR TEMPERA-RE ANALYSIS,
ps of Engineers, Sacramento, Calif.
. Beard, and R. G. Willey.
ter Resources Research, Vol 6, No 5, p 1335-5, Oct 1970. 11 p, 7 fig, 2 tab, 4 ref.

scriptors: *Water temperature, Reservoir opera-, Solar radiation, *Reservoirs, *Water quality, Stratification, Hydrology, Outflows, Energy transfer, Air temperature, Models, Reservoir evaporation, Inflow, Water resources development, Quality control, Thermocline, Computer programs, *Computer models, Hydrologic data, Reservoir stroage.
Identifiers: Temperature studies.

Several mathematical models for analyzing reservoir temperature stratification involving examination of hourly temperature changes have been developed. Use in practical applications is limited because of large amounts of observational data required. There is an increasing use of reservoir storage for bridging drought periods that requires examination of many combinations of reservoir storage levels and seasonal inflow patterns. Selecting a few representative years for analysis is not possible because 30 or more years of data are required. This approach is practical only if a long computation interval, such as one month, may be used. Observational data needed in existing models are ordinarily not available. A practical model must use generalized data such as average air temperature and average radiation. A generalized model must be capable of making releases through specific outlets or automatically selecting the outlets that will maintain outflow temperatures within a desired range as long as possible and leave the temperature of the remaining stored water at an optimum value. A computer program has been developed that conforms to these requirements and automatically calibrates the model. (USBR)
W71-07072

OPTIMAL POLICY FOR OPERATION OF A MULTIPURPOSE RESERVOIR,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W71-07133

OPTIMAL PLANS FOR CAPACITY EXPANSION OF WATER-SUPPLYING FACILITIES,
Illinois Univ., Urbana. Water Resources Center.
Hirohide Hinomoto.
Available from the National Technical Information Service as PB-198 521, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 39, Jan 1971. 59 p, 5 fig, 7 tab, 33 ref, append. OWRR Project S-014-ILL (1).

Descriptors: *Economic feasibility, *Optimum development plans, Facilities, Linear programming, Markov processes, *Water supply, Water treatment, Optimization, distribution systems, Model studies, *Planning, *Costs, Operating costs, Estimated costs, *Storage capacity.

A rapid increase in population accompanied by sustained improvement in living standards has necessitated the consideration of expanding the water treatment and or distribution systems in many areas. To aid in these considerations an economic decision model for selecting optimal expansion plans has been developed. The model formulated is composed of an objective function minimizing the total cost of investment and operation and set of constraints on the treatment and storage capabilities satisfying the annual requirements on the expected maximum daily demand. Equalization during the daily peak period and fire fighting scale effects in the capital and operating costs were represented in the model by exponential functions. Demand was assumed to continuously increase over a finite period beyond which it stays at a maximum level. The original nonlinear formulation was linearized and then applied to the Champaign-Urbana area for demonstration purposes. It was concluded that the usefulness of the model depends much on the availability of reliable information on future demands and the capital and operating costs of the proposed facilities. Furthermore there is a need to more clearly identify the relationship between designing under capacity and the penalty that this decision imposes on the water supplying agency.
W71-07134

STREAM QUALITY MODELING BY QUASILINEARIZATION,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. Stanley Lee, and Irving Hwang.
Journal Water Pollution Control Federation, Vol 43, No 2, p 306-317, Feb 1971. 12 p, 2 fig, 8 tab, 6 ref. OWRR Project B-015 KAN (5).

Descriptors: *Mathematical models, *Water quality, *Biochemical oxygen demand, *Dissolved oxygen, Water pollution, Path of pollutants, Water pollution effects, Linear programming, Model studies, Numerical analysis.
Identifiers: *Water quality models.

The quasilinearization technique, also known as the generalized Newton-Raphson method, can be used to identify or estimate the parameters in river or stream pollution. The parameters can be estimated directly from the differential equations representing the pollution model and from measured data such as biochemical oxygen demand and dissolved oxygen. Because of the rapid convergence property of this approach, it is a powerful technique for the dynamic modeling of water pollution problems. Several examples are solved to illustrate the technique. With very approximate initial guesses for the unknown parameters, only three to five interations are needed to obtain a four- to five-digit accuracy. (Knapp-USGS)
W71-07187

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES.
Illinois State Dept. of Business and Economic Development, Springfield.

Available from the National Technical Information Service as PB-196 814, $3.00 in paper copy, $0.95 in microfiche. May 1970. 53 p, 22 fig, 13 tab. HUD Project No Ill P-260.

Descriptors: *Planning, *Water resources development, *Long-term planning, *Illinois, *Financing, *Administration, *Investment priorities, Analytical techniques, Evaluation, Coordination, Administrative agencies, Water demand, Water quality control, Recreation, Flood damage.
Identifiers: *Guidelines, Implementation techniques.

This is a resume of an in-depth study of the overall planning and administrative considerations relating to water resource developments in Illinois involving possible state financial participation. The report summarizes basic state needs, guidelines and priorities. The priorities guide Illinois investment in major water resource activities involving State programs or developmental responsibilities. State guidelines for administrative evaluation and for expediting specific proposals are clearly defined. These administrative tools are designed to speed accurate evaluation and processing of both state and federal development activities. Coordinated guidelines and a system of priorities are presented to facilitate the administration of federal or state financial assistance to local communities for each of the water resource related programs. Major emphasis is placed on the self-help financial need values. Adoption of the planning, evaluation, and selection procedures by the Illinois Natural Resource Development Board in May 1970 initiates the active use of the proposed implementation techniques by the participating agencies. The comprehensive compilation of technical resource data in the separate technical appendix further serves as a reference bank and inventory base for future water resource activity. (See also W71-07198) (Poertner)
W71-07197

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES, TECHNICAL APPENDIX.
Illinois State Dept. of Business and Economic Development, Springfield.

Available from the National Technical Information Service as PB-196 815, $3.00 in paper copy, $0.95 in microfiche. May 1970. 137 p, 32 fig, 43 tab, 48 ref. HUD Project No Ill P-260.

Descriptors: *Planning, *Water resources, *Illinois, *Statistics, *Water supply, *Water demand, *Census, Water utilization, Flood damage, Water quality control, Recreation, Administration, Economics, Investment, Evaluation.
Identifiers: *Water resources statistics, *Water facilities, Data summaries, Water data tabulations.

This Appendix presents the water supply condition for the 1,300 incorporated Illinois communities. Eight regions corresponding roughly, on a county basis, to the river basins are mapped and the summarized data are listed in a table. Tables are also included listing communities where well-capacity or the surface water source could soon become deficient, where filtration plants or pumping capacity can no longer meet increasing demands, and where there are no public water supplies. The report raises many questions which will require further investigation. For instance, actual gallons per capita consumption has been on the increase. How much of this is due possibly to increased leakage as the water system ages can be determined only where all the water is metered. Increased use of wash water in filter systems is tied closely to population increases as is the increased municipal government use of water, most of which is unmetered. Discussions of the data presented in the tables and predictions of future water conditions and requirements are included. (See also W71-07197) (Poertner)
W71-07198

BIBLIOGRAPHY, SELECTED REGIONAL, STATE, AND OTHER GOVERNMENTAL AGENCY WATER RESOURCES PLANNING DOCUMENTS,
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
Richard N. Symonds, Jr., and Sidney C. Albertsen.
Available from the National Technical Information Service, as PB-196 623, $3.00 in paper copy, $0.95 in microfiche. Apr 21, 1970. 24 p. HUD Project No P-102.

Descriptors: *Bibliographies, *Publications, *Information retrieval, *Planning, *Water resources development, *Connecticut, Long-term planning, Short-term planning, Sewerage, Water supply, Drainage programs, Flood control, Recreation.
Identifiers: *Planning documents, Regional planning.

This bibliography includes reports and documents relating to water resources planning in Connecticut and is presented in two parts. Part I is a listing of the publications by 'authorizing-agency' categories and 'subject' classifications. Part II is a listing by 'subject' categories and 'authoring-agency' classifications. The bibliography was prepared to fulfill one of the objectives of the Connecticut Water Resources Planning Project which was authorized by Public Act 477 of the 1967 Connecticut General Assembly. The bibliography includes an inventory of selected regional planning agency reports, river basin study reports, and a variety of miscellaneous federal, interstate, and State agency documents. It was prepared to serve as a working document for the staff of the Water Resources Planning Project, but it is being made available to other agencies for information purposes. Reports and publications contained herein are on file with the Connecticut Water Resources Planning Project staff in the Office of State Planning, and can be examined in the office. The listing contained in the bibliography does not necessarily indicate general availability of documents. Some documents are out of print and are not available for distribution while others are available upon request. A total of 103 publications are listed. (Poertner)
W71-07200

A STATUS REPORT AND DESCRIPTION OF COMPREHENSIVE LONG RANGE WATER RESOURCES PLANNING IN CONNECTICUT.
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.

Available from the National Technical Information Service, as PB-196 621, $3.00 in paper copy, $0.95 in microfiche. Apr 21, 1970. 5 p, 1 fig, 1 tab. HUD Project No P-102.

Descriptors: *Planning, *Long-term planning, *Short-term planning, *Water resources development, *Connecticut, Sewerage, Water supply, Project planning.
Identifiers: *Regional planning agencies.

Progress made in developing a statewide long range plan for the management of water resources in Connecticut and in preparing regional sewer and water facilities plans is summarized. Public Act 477 of the 1967 General Assembly, together with amendments to the Act passed in 1969, authorized this work and provided $1,500,00 of bond issue funds. The Act designates that the plans be prepared jointly by the Water Resources Commission, the State Health Department, the State Board of Fisheries and Game and the Connecticut Development Commission. An Interagency Water Resources Planning Board was created to carry out the requirements of the Act. The Office of State Planning is the contracting and administrative agency for the Board. The following has been accomplished: inventoried recreational, water supply, sewerage and flood control facilities along with uses and needs relating to Connecticut water resources; prepared work maps, charts and graphs; inventoried files and listings of planning materials and documents on Connecticut water resources; evaluated the water supply and sewer requirements of the four alternative planning concepts for future land use prepared by the Connecticut Interregional Planning Program; and evaluated Regional Planning Agency recommendations to determine interregional and statewide implications. Major work remaining includes: immediate and long range water resources plans; specific recommendations and proposals; and a statewide long range plan for the management of the States' water resources. (Poertner)
W71-07201

DOWNTOWN: AN ECONOMIC-ENVIRONMENTAL SIMULATION GAME,
Pennsylvania State Univ., University Park.
Wesley H. Long.
Reprint Series No 17 from: Proceedings of the Second Annual Environmental Design Research Association Conference, Pittsburgh, Pennsylvania, Oct 1970. 8 p, 5 tab, 1 fig.

Descriptors: *Urbanization, Environment, Economics, City planning.
Identifiers: *Economic-Environmental simulation game, Town council, Metropolitan Areas, Urban environment.

This game is designed to bring out interactions among economic and environmental decisions. Teams have economic interests focused by their roles in the game and environmental interests focused by their habitation locations in a town. They vie individually through exchange and collectively through an elected Town Council to achieve economic gain and an improved environment. Conflicts encountered between teams and Town Council when they attempt to realize both the goals simultaneously replicate in miniature and in a collapsed time frame the strains and tensions experienced by a real community. (Wray-Chicago)
W71-07317

ON THE EXTENSION OF INPUT-OUTPUT ANALYSIS TO ACCOUNT FOR ENVIRONMENTAL EXTERNALITIES,
Dartmouth Coll., Hanover, N.H.
A. O. Converse.
American Economic Review, Vol LXI, No 1, 197-198, Mar 1971.

Descriptors: *Input-output analysis, *Economi analysis, *Environment, *Pollution, Wastes, Taxe Government, Capital, Investment, Conservatio Waste treatment, Social aspects.
Identifiers: *Ayres-Kneese model, Consumptio activities, Residuals, Pollution tax.

The Ayres-Kneese model of input-output analysis extended. The model had been originally extende to include the flow of wastes to the environme and the recycle flow of wastes to the productio sectors by adding two sectors of consumption a environment. The author further extends th model after showing that, as presented above, it d not correctly account for the individual was residues from the various production secto Changes are proposed to alter this situation, inclu ing a change which permits accounting for the va ous types of waste residue from both productio and consumption activities. This last change bei necessitated by specific residue activities. It pointed out that such treatment while changing t composition of the waste residues increases t total amount of them, rendering pollution analy of total residue useless for pollution control pu poses. For this reason, this article is especially u ful for efficient pollution analysis, and therefo optimal pollution control measures of environme tal factors. (Murphy-Rutgers)
W71-07560

A BARGAINING MODEL OF THE PU THEORY OF PUBLIC EXPENDITURE,
York Univ. (England).
Shibata Hirofumi.
Journal of Political Economy, Vol 79, No 1, p 1-2 Jan-Feb 1971.

Descriptors: *Government, Optimization, Incon Social aspects, Budgets, Model studies, Tax Cost, Marginal costs, Government supports, W fare economics.
Identifiers: *Public goods, *Public expenditure, lateral monopoly, Behavioral assumptions, Pare optimality, Isoguants, Externalities.

This article presents a geometric analysis of pu goods similar to that of bilateral monopoly after dicating the essential identity of the two theorie the typical bargaining between a few self-interes parties contracting in the absence of external pu sure. The article first demonstrates that the pu theory of public expenditure formalized in terms a collective-consumption (or public) good can shown diagramatically similar to a case of bilate monopoly. The author then relates the diagra matic exposition of the determination of public penditure to earlier studies in the area to show t their different implicit behavioral assumptions to blame for the disagreements. Finally the pa limits the range of possible equilibrium solution terms of public and private product mix and the bill distribution for certain cases, including relative marginal costs of public expenditure. T step is necessary to avoid the result of multi solutions unless other nonconomic variables introduced. This article is relevant to water stu because of its theoretical insights into public go and expenditures issues. (Murphy-Rutgers)
W71-07580

PARETO, PUBLIC GOODS AND POLITICS,
McMaster Univ., Hamilton (Ontario).
David M. Winch.
Canadian Journal of Economics, Vol 2, No 4 492-508, Nov 1969.

Descriptors: *Resource allocation, Wel economics, Taxes, Decision-making.

entifiers: *Pareto optimum, Equity, Income distribution, Public good, Benefit taxation.

is article examines the consequences of a Pare- n value judgment on a model encompassing both ivate and public goods. Distribution must be de- ded first and be imposed by government, while al- cation between private and public goods depends the nature of the utility function. The author ex- ores the possibility of determining the optimum lue of public goods through the democratic litical process or majority rule. Majority rule aches an equilibrium allocation but the sub- quent allocation is not optimal. Political system olving pressure groups, propaganda, vote trad- and bribery can lead to a Pareto optimum ult. These conclusions are interpreted as point- out the dangers of confusing equitable income tribution and optimal resource allocation. This per is relevant to water research concerned with theoretical aspects of the role of equity criteria decision making. (Siegenthaler-Rutgers)
71-07581

INT GOODS,
ns Hopkins Univ., Baltimore, Md.
lliam H. Oakland.
onomica, Vol XXXVI, No 143, p 253-268, Aug 69.

scriptors: *Resource allocation, *Welfare nomics, Taxes.
ntifiers: *Externality, Subsidy, Joint good, reto optimality, Public good, Social cost, Social efit.

is paper considers a generalization and extension Samuelson's public goods analysis to goods for ich jointness in consumption is not complete. nt goods share some of the features of both vate and public goods and the analysis of joint ods is most suitable for the problem of externali- in consumption. The conditions for Pareto op- ality for joint goods differ from the public goods e and involve restrictions upon the pattern of ect consumption by individuals. Since the mar- economy does not generate a Pareto optimal ution for joint goods, the author suggests the vernment use a pricing scheme based on taxes subsidies to satisfied Pareto conditions. This cing policy is based upon information concern- the marginal rate of substitution between direct indirect consumption. Finally, the provisions of t goods within a federal system is analyzed ng with optimal policy for grants-in-aid to the es. This paper is relevant to water research con- ned with the theory of public expenditure and ation. (Siegenthaler-Rutgers)
1-07582

OTE ON THE DYNAMIC PLANNING OF IN- STMENT PROJECTS,
chnion - Israel Inst. of Tech., Haifa; and Mon- l Univ. (Quebec).
rdechai Shechter, and Peter L. Hammer.
ropean Economic Review, Vol 2, No 1, p 111- , Fall 1970.

scriptors: *Decision making, Non-linear pro- mming, Budget constraint, Economic evalua- , Cost, Discount rate.
ntifiers: *Dynamic planning, Capital budgeting, ective function, Present value, Boolean nique.

s paper considers the problems of optimally cting investment projects with a finite planning izon using a non-linear programming model. s formulation allows the author to consider plex problems without restricting the analysis nodels involving only linear constraints and ob- ive functions. The author first considers a one od capital budgeting model which is formulated naximizing the net present value of the benefits ject to budget constraints. The more general e of time dependent capital budgeting is then ussed with constraint equations composed of technological and budget dependencies. An outline of the solution method to this model is given using Boolean techniques. The author uses as an example the case of three independent projects and then illustrates how the non-linear programming method generates an optimal solution. This article is relevant to water research concerned with capital budgeting analysis. (Siegenthaler-Rutgers)
W71-07587

DYNAMIC PROGRAMMING FOR CONJUNCTIVE WATER USE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 04B.
W71-07616

OPERATIONAL HYDROLOGY FOR UNGAGED STREAMS BY THE GRID SQUARE TECHNIQUE,
Department of Energy, Mines, and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 02E.
W71-07622

QUASILINEARIZATION AND THE IDENTIFICATION OF AQUIFER PARAMETERS,
California Univ., Los Angeles. Dept. of Engineering Systems.
William W-G. Yeh, and George W. Tauxe.
Calif Univ Water Resources Center Project W290. Water Resources Research, Vol 7, No 2, p 375-381, Apr 1971. 7 p, 2 fig, 3 tab, 10 ref.

Descriptors: *Parametric hydrology, *Linear programming, *Mathematical models, *Aquifer characteristics, Simulation analysis, Computer programs, Storage coefficient, Transmissivity, Confined water, Systems analysis, Data processing.
Identifiers: Quasilinearization.

A new computational procedure based on observations at observation wells is presented to solve the problem of identifying aquifer parameters. This new procedure (quasilinearization), is an effective way to convert the observations directly to aquifer parameters. The procedure is advantageous because it involves neither curve plotting nor graphical matching. It makes full use of the ability of the modern high speed digital computer to integrate a system of ordinary differential equations with given initial conditions. The parameters to be identified are the storage coefficient and transmissivity in a confined aquifer system. (Knapp-USGS)
W71-07628

A COURSE OF LECTURES ON PARAMETRIC OR ANALYTICAL HYDROLOGY,
University Coll., Galway (Ireland).
J. E. Nash.
Great Lakes Institute, University of Toronto, P R 38, 1968-1969. 177 p, 64 fig, 3 tab, 5 append, 30 ref.

Descriptors: *Hydrology, *Analytical techniques, *Parametric hydrology, *Systems analysis, *Optimization, *Unit hydrographs, *Frequency analysis, Runoff.
Identifiers: *Linear hydrologic system, Conceptual models.

This paper presented the 15 lectures given by the author on Parametric or Analytical Hydrology at the Universities of Ontario. Included in the subjects of these lectures were: applied hydrology; systems and the operation method; lumped time-invariant linear system, in respect to convolution, and continuity, stability, damping; hydrologic systems; discrete expression of convolution; and unit hydrograph computation. A general linear hydrologic system was described in detail. The relationship between the unit hydrograph and the catchment was investigated and many different approaches were cited. An explanation of the use of conceptual models of the runoff process was given and such operations as optimization and sampling variance were noted. The last of the lectures dealt with hydrologic frequency prediction, specifically prediction from samples, indirect prediction and use of inference methods. The appendices provide some additional operational techniques. (Kriss-Cornell)
W71-07693

SOCIO-ECONOMIC SIMULATION FOR WATER RESOURCE SYSTEM PLANNING,
Department of Energy, Mines and Resources, Ottawa (Ontario). Policy and Planning Research Branch.
Peter J. Reynolds, and Asit K. Biswas.
Report, Resources Research Centre, Policy and Planning Branch, Dep of Energy, Mines and Resources, Ottawa, Canada, 1969. 8 p, 23 ref.

Descriptors: *Simulation analysis, *Water resources, *Planning, *Forecasting, *Decision making, Economics, Resource allocation, Government supports, Evaluation.
Identifiers: Regional models, Economic behavior, Socio-economic models.

The current status of socio-economic simulation in water resource planning was examined. Two broad subsystems in water resource planning were distinguished: the physical-technologic subsystem and the socio-economic subsystem. By selecting the significant variables in a given economy, and analyzing the interaction between them, it was possible to develop economic models which would be of great value in interpreting, if not predicting, economic behavior of the real world. Regional economic models provided a better structural understanding of the complex processes of economic and behavioral interactions within a system, as well as making possible regional forecasts. These in turn, provided guidelines for better policy planning and decision making. Three problem-oriented models were discussed: the Lehigh, Ohio, and Susquehanna basins. Efficient allocation of limited national resources among competing government programs was achieved by the measurement of their relative cost effectiveness. This could be done by the evaluation of social, political and economic effects on human beings, using national and regional socio-economic models. (Thiuri-Cornell)
W71-07695

6B. Evaluation Process

THE ECONOMIC FEASIBILITY OF ESTABLISHING AN IRRIGATED FORESTRY ENTERPRISE ON THE HANFORD RESERVATION, WASHINGTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05D.
W71-07152

THE EGYPTIAN AGRARIAN REFORM: PROBLEMS AND PROSPECTS,
For primary bibliographic entry see Field 03F.
W71-07163

CONSIDERED LAKE ERIE-LAKE ONTARIO WATERWAY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
T. E. Murphy.
Sponsored by US Army Engineer District, Buffalo. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-3, Apr 1970. 14 p, 8 tab, 8 photo, 10 pl.

Descriptors: *Inland waterways, *Hydraulic models, Navigation conditions, Locks.
Identifiers: *Lake Erie-Lake Ontario Waterway.

Investigation was conducted to assist in determination of the economic justification of a water route connecting Lake Erie and Lake Ontario. Specifically, the studies involved determination of the most functional and economical location for a lock in the vicinity of Buffalo, N.Y., and evaluation of navigation conditions at the entrance to an overland canal joining the American channel of the Niagara River northwest of North Tonawanda, N.Y. An existing model of the Niagara River with a horizontal scale of 1:360 and a vertical scale of 1:60 and a new undistorted model of the canal entrance with a 1:120 scale were used in the investigation. Tests demonstrated the desirability of placing the new lock in the vicinity of Buffalo as far downstream as is feasible without rendering the existing Black Rock Lock and Canal inoperable during the construction period. Navigation problems at the canal entrance were not as severe as had been contemplated and a small amount of overexcavation resulted in satisfactory conditions. (Murphy-WES)
W71-07172

THE UNIVERSITY'S ROLE IN NATIONAL WATER POLICY.

Flack, J. Ernest, Editor. Proceedings of Universities Council on Water Resources Conference, July 27-28, 1970, Blacksburg, Virginia, 1970. 128 p, 3 append.

Descriptors: *Conferences, *Water resources development, *Universities, Water resources research act, Training, Research and development, Planning, Economics, Social aspects, Social impact, Education, Management, Water management (Applied), Water demand.
Identifiers: *Universities Council on Water Resources.

The Universities Council on Water Resources is an organization of universities that are active in both graduate education and research in water resources. The aim of the Council is to encourage education and research in these areas and to provide a clearing house for information as well as a forum for discussion of questions of mutual interest. This conference proceedings is the record of one of a series of meetings that have been held annually since 1965. The topics discussed include national water policy, planning, education, research, sociology, land-water relations, hydrology, water quality, and water resources engineering. (Knapp-USGS)
W71-07183

A STUDY OF LOCAL NEEDS FOR WATER POLLUTION CONTROL FACILITIES IN FISCAL YEARS 1971-76.
National League of Cities, Washington, D.C.; and United States Conference of Mayors, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-07192

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES.
Illinois State Dept. of Business and Economic Development, Springfield.
For primary bibliographic entry see Field 06A.
W71-07197

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES, TECHNICAL APPENDIX.
Illinois State Dept. of Business and Economic Development, Springfield.
For primary bibliographic entry see Field 06A.
W71-07198

BIBLIOGRAPHY, SELECTED REGIONAL, STATE, AND OTHER GOVERNMENTAL AGENCY WATER RESOURCES PLANNING DOCUMENTS,
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
For primary bibliographic entry see Field 06A.
W71-07200

A STATUS REPORT AND DESCRIPTION OF COMPREHENSIVE LONG RANGE WATER RESOURCES PLANNING IN CONNECTICUT.
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
For primary bibliographic entry see Field 06A.
W71-07201

INFORMATION FOR THE FUTURE: THE WEST SIDE SAN JOAQUIN VALLEY PROJECT.
California Univ., Los Angeles. Water Resources Center.

Partially supported by Water Resources Center, Univ of Calif and by Dept of Housing and Urban Development. West Side San Joaquin Valley Coordinating Council, California University Water Resources Center Report No 20, Sept 1970. 22 p, 1 fig, 2 map, 2 photo, 1 tab. Project W-187.

Descriptors: *Environmental engineering, *California, *Water resources development, Land development, Economics, Valleys, Agriculture, Recreation, Population, Education, Projects, Planning, Reviews.
Identifiers: *San Joaquin Valley (Calif).

Long-term plans among California's institutions of higher education, the state and local governments, and public, private, and voluntary organizations for developing the San Joaquin Valley are summarized. Issues such as the following are among those to be examined in the proposed study: Potential impacts of new water and transportation links that are being built now through the West Side of the Valley and their possible effects on the Valley's ecology, public service systems, industries, and social environment. Location, magnitude, characteristics, and effects of possible new population growth in the Valley; and Public and private policy alternatives that might assure Valley residents that their future will not be overcrowded, polluted, or conflict ridden in the manner that already has blighted some other developing areas of the United States. (Woodard-USGS)
W71-07241

CRISIS IN WATER SUPPLY,
David Clutterbuck.
New Scientist and Science Journal, Vol 49, No 743, p 624-627, Mar 18, 1971. 4 p, 2 fig, 2 photo.

Descriptors: *Water supply, *Water shortage, *Water resources development, Surface waters, Groundwater, Water storage, Reservoirs, Water demand, Water consumption, Aquifers, Injection wells, Recharge wells.
Identifiers: *England.

Large areas of Britain are on the verge of acute water shortage, resulting from the disruption of supply programs, and there are no short term remedies. Britain is not a wet country. In Europe, only Malta has a lower mean annual rainfall. Reservoirs are responsible for only a minute fraction of the agricultural land appropriated for other uses each year, but they are vulnerable to public criticism because the land they use is concentrated into a few large plots. Until recently most undertakings were able to draw on their surpluses, but these have been gradually eroded by increasing demand, and shortages in some areas are beginning to assume crisis proportions. Too great a lowering of the water table increases the risk of infiltration by seawater--which, in this case, has already begun. The Water Resources Board, which at present has only an advisory status, wants the power to organize national water supplies on a mandatory basis. (Woodard-USGS)
W71-07282

WATER FOR THE FUTURE OF LONG ISLAND NEW YORK,
Geological Survey, Albany, N. Y.
Philip Cohen, O. L. Franke, and B. L. Foxworthy.
New York Water Resources Bulletin 62A, 1970. 3 p, 14 plate.

Descriptors: *Water management (Applied *Water resources development, *New Yor Water resources, Groundwater, Surface water Aquifers, Saline water intrusion, Artificia recharge, Safe yield, Water wells.
Identifiers: *Long Island (NY).

This booklet summarizes the water resources Long Island, N. Y., and emphasizes some of the di ferent approaches that might be taken in managin the water resources of Long Island. Water-manag ment objectives, ranging from very general to ve specific, should be clearly and precisely define All the alternative methods of achieving these ob jectives should be recognized. Many alternati methods of development are, to some extent, sel defeating. For example, the construction of sewe to prevent pollution from cesspools and dispos basins could substantially decrease artifici recharge and, therefore, might accelerate pollutio by encroaching salt water. Likewise, artifici recharge using reclaimed sewage water may he alleviate the problem of salt-water intrusion, but also ultimately could cause an undesirable increa in the dissolved-solids content of the groundwate Other alternatives, ranging from desalination of s water (or of salty groundwater from the zone of di fusion) using atomic energy, to a recent propos for converting Long Island Sound into a huge fres water reservoir, must be carefully considered. (K napp-USGS)
W71-07293

WATER FOR CALIFORNIA--OUTLOOK 1970.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 06D.
W71-07296

ATTITUDES FOR ENVIRONMENTA PLANNING IN THE 1970's,
Utah State Univ., Logan.
Dean F. Peterson.
Water Research Laboratory, Occasional Paper Utah State University, Logan, Utah, June 1970. p.

Descriptors: *Attitudes, *Environment, *Planni *Social aspects, Population, Decision making.
Identifiers: *Environmental design, Ecologic system.

The engineer stands between science and socie and it is his special job to apply science to the use resources for the benefit of man. Society benefitted by the engineer's contribution to pub water supply systems, agriculture, transportatio electricity, urban planning, and environmen matters. Four suggestions to be considered by gineers who work with environmental design offered: (1) We need to understand and appreci ourselves as part of nature, not as separate from (2) We need to recognize that absolute solutions environmental problems do not exist, that solutio are choices among options; (3) We need to rec nize the difficulty of the decision-making proc when the common earth environment is involv (4) We need to reassess our own personal valu and priorities. (Wray-Chicago)
W71-07309

THE SAN FRANCISCO BAY PLAN: COMBI ING POLICY WITH POLICE POWER,
For primary bibliographic entry see Field 06E.
W71-07316

N OPTIMAL SITING MODEL FOR THERMAL LANTS WITH TEMPERATURE CON-TRAINTS,
ohns Hopkins Univ., Baltimore, Md. Dept. of eography and Environmental Engineering.
or primary bibliographic entry see Field 05G.
71-07423

MPLEMENTATION OF REGIONAL ESEARCH IN WATER-RELATED ROBLEMS.
conomic Research Service, Madison, Wis.

assey, Dean T, ed. Report of a Seminar held at arm Foundation, published by Department of aw, University of Wisconsin, Madison, Jan 1970. p.

escriptors: *Planning, Institutions, *Legal pects, Management, *Regions, *Interstate.
entifiers: North Central Land Economics esearch Committee, National Water Commission, orps of Engineers.

is publication is the printed proceedings of a one y seminar, held at the Farm Foundation in icago on January 14, 1970, which explored ap-oaches to implementing economic and legal search on regional water-related problems. The blication includes four speeches and responses these speeches. (See also W71-07498 thru W71-500) (Holmes-Rutgers)
71-07497

ROMISING AREAS FOR RESEARCH ON IN-TITUTIONAL DESIGN FOR WATER ESOURCES MANAGEMENT,
isconsin Univ., Madison. Dept. of Urban and Re-onal Planning.
ing K. Fox.
Implementation of Regional Research in Water-lated Problems, Report of a seminar, University Wisconsin, p 29-40, 1970. 14 ref.

escriptors: *Decision-making, Cost sharing, litical aspects, Government finance, Social eds, Social participation, *Regions, *Interstate, nstitutions, Institutional constraints.
entifiers: *Commerce Clause (US Consitution), izona, High Plains of Texas.

sic problems of U.S. institutions that are con-rned with water resources management are cussed. Specifically, in describing four areas, mely water quality management, the use of orelands and flood plains, development of vigation facilities and the provision of irrigation ter in the West, the author finds a lack of com-nication between the people paying the bills for ese projects and the ones benefiting from these ojects. He identifies the number one item for blic study as the 'search for a precise formulation the conditions institutions must meet to serve ciety effectively.' He, furthemore, emphasizes need for more communication between the nners and the public, so that everyone can have opportunity to understand the available alter-ives and express their intelligent opinion about ure publicly financed water resource and water ality projects. (See also W71-07497) (Holmes-tgers)
71-07498

IORITIES FOR DEVELOPING LEGAL AND ONOMIC RESEARCH ON WATER OBLEMS,
ricultural Research Service, Beltsville, Md. Soil d Water Conservation Research Div.
Van Schilfgaarde.
Implementation of Regional Research in Water-lated Problems, Report of a seminar, University Wisconsin, p 1-12, 1970. 23 ref.

scriptors: *Planning, *Institutions, Evaluation, cial aspects, *Economics, *Regions.

Areas for future research in water problems are identified and the need for more interdisciplinary approaches to this research are stressed. Also discussed are some of the institutional problems that researchers face with special emphasis on the research situation at the Agricultural Research Service of the U.S. Department of Agriculture. The author points to several examples of well integrated research between social scientists and physical scientists but criticizes many for working in isolation and not relating their specific research problem to the larger problem. (See also W71-07497) (Holmes-Rutgers)
W71-07499

A NEW LOOK AT NATIONAL WATER POLICY,
National Water Commission, Arlington, Va.
Theodore M. Schad.
In: Implementation of Regional Research in Water-Related Problems, Report of a seminar, University of Wisconsin, p 61-70, 1970. 5 ref.

Descriptors: *Federal government, *Planning, Water resource development, Regions, Interstate, *Water policy.
Identifiers: *National Water Commission, Colorado River Basin.

The National Water Commission's tasks and progress during its first year of activation are described. Established in September 1968, the National Water Commission is charged with the task of 'preparing a report on the nation's water needs and making recommendations simultaneously to the President and the United States Congress as to how these needs can best be met.' By holding conferences throughout the country, the Commission has attempted to identify the problems that are most important to the public. In addition, the Commission has attempted to tap the minds of as many of the leading water authorities as possible and has initiated new studies on several important aspects of water resources problems. The Commission will submit its report in 1973. (Holmes-Rutgers)
W71-07500

RIVER BASIN AUTHORITIES: A NATIONAL SOLUTION TO WATER POLLUTION,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W71-07559

REGIONAL DEVELOPMENT, EXTERNALITIES AND TAX-SUBSIDY COMBINATIONS,
Virginia Univ., Charlottesville.
Roger Sherman, and Thomas D. Willett.
National Tax Journal, Vol XXII, No 2, p 291-293, June 1969.

Descriptors: *Water pollution, *Tax, Water quality, Resource allocation, Economic efficiency, Decision making.
Identifiers: *Externalities, *Subsidy, Opportunity cost, Equity, Social cost, Regional development.

The implications for economic efficiency are considered when tax-subsidy combinations for industrial development and pollution control are combined. Recent research has stressed the symmetry between tax and subsidy means of controlling external diseconomies in water quality management when income distribution and administrative asymmetries are ignored. In the long run the imposition of a tax on polluters or a subsidy to firms complying with anti-pollution measures result in differences in the size of external effects and economic efficiency. This is due to the difference in the placement of the cost burden either on firms or the community as a whole. When the burden is placed on firms, firms may shift location and hence this results in loss of employment to the community. To alleviate this problem, the authors suggest the cost of pollution be shared equally by the firm and community with a combination tax and subsidy scheme. Furthermore, greater coordination among communities on industrial development would result in more acceptable pollution levels on a regional basis. (Siegenthaler-Rutgers)
W71-07562

A THREE STEP APPROACH TO POLLUTION REVERSAL,
Oregon Univ., Eugene.
Roman R. Andrus.
University of Washington Business Review, Vol 29, No 4, p 37-43, Summer 1970.

Descriptors: *Pollution abatement, Effluent charge, Economic efficiency, Cost-benefit analysis, Waste water disposal.
Identifiers: *Externalities, Social disutility tax, Subsidy.

An approach to pollution control is proposed utilizing a three step process aimed at controlling the three basic forms of pollutants. The author defines the basic forms of pollutants as the production and distribution of by-products by industry, the by-products of the consumption process and space allocation failures. First, standards are set for environmental quality to deal with problems of solid and waste water disposal. Secondly, pollution control requires that firms or individuals bear the liability for being the source of pollutants. Third, the author suggests that initially incentives must be provided by the government in terms of subsidies or tax relief to encourage firms to comply with pollution control objectives. As a second step, effluent charges should be levied in increasing amounts on firms who continue to engage in polluting activities. (Siegenthaler-Rutgers)
W71-07563

PROCEEDINGS, GREAT LAKES WATER RESOURCES CONFERENCE.

Toronto, Canada, the Hydro-Electric Power Commission of Ontario, June 24-26, 1968. 489 p.

Descriptors: *Great Lakes, *Water use, *Water resources planning, *Water quality, *Flow regulation, Multiple use, Navigation, Recreation, Pollution, R and D, Costs, Technology, Government, Lakes, Rivers, Optimization.
Identifiers: *Economic development, Shore property, Cost sharing, Canada.

This book is a compilation of several papers given at the Great Lakes Water Resources Conference, which was gathered to present and disseminate information bearing on the management and administration of various aspects of the Great Lakes resource. Topics presented include multiple uses of the Lakes, regulation of the lakes, and water quality in the lakes. The historical development of these topics is surveyed, as are present problems in the various areas. The water resource is viewed from both Canadian and United States viewpoints, particularly in its impact on the regional economies of the areas in the Great Lakes drainage basin. The future potential development of the Great Lakes as a resource is projected; and various development plans are proposed. A large segment of the book is concerned with the problem of pollution and methods to remedy and/or prevent such destruction in future development plans, as suggested by professionals in all appropriate areas. (See also W70-07566 thru W71-07576) (Murphy-Rutgers)
W71-07565

HYDRO-ELECTRIC POWER DEVELOPMENT ON THE GREAT LAKES SYSTEM,
Hydro-Electric Power Commission of Ontario, Toronto.
H. A. Smith.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Commission of Ontario, p 49-88, 1968.

Descriptors: *Hydro-electric power, *Great Lakes Region, *Flow regulation, *Lakes, *Water

resource development, Navigation, Water quality, Thermal pollution, Water supply, Recreation.
Identifiers: *International treaty, Economic development, Electric energy, Pumped storage plants.

A defense is presented of the need for additional hydro-electric power development on the Great Lakes system, proposing that such development is warranted by the expected benefits to the community and the constantly changing magnitude of the needs of the community for water resource exploitation. The past hydro-electric power development of the Great Lakes region as representative of the field. A brief description is given of the benefits of such development, treating such economic aspects as power development for community use, lake regulation, and navigation channels, in addition to the creation of parks and recreation areas and the enhancement of science spectacles. Additional electric energy could be produced by means of additional international lake regulation measures and/or by the construction of additional plant. Such economic developments could be achieved, the author suggests, by exploiting some of the characteristics of the Great Lakes system. (See also W71-07565) (Murphy-Rutgers)
W71-07566

HISTORY OF THE DEVELOPMENT OF USE OF THE GREAT LAKES AND PRESENT PROBLEMS,
Army Engineer Div., Chicago, Ill.
C. F. Macnist, and H. F. Lawhead.
In: Great Lakes Water Resources Conference, Toronto, the Hydro Electric Power Commission of Toronto, p 1-48, 1968.

Descriptors: *Great Lakes Region, *Water resource development, Population, Water supply, Economic analysis, Rivers, Lakes, Hydrology, Watershed, Transportation, Conservation, Recreation, Geography.
Identifiers: *Multiple-use resource, *Interdisciplinary approach, Power development.

Various aspects of the Great Lakes basin are considered, such as the resources of abundant water supply, the natural regulating influences of the lakes' surfaces, the minerals of the basin and nearby areas, and the surrounding arable and timbered regions. A brief history of the area's rapid development introduces the article, citing the growing population which will eventually call for further development and utilization of the Great Lakes resource by both the United States and Canada. The geography, geology, climatology, and hydrology of the Lakes and their drainage basin are described, as well as the economic ramifications of the area's development in commercial fishing, population growth, water transportation, mining, manufacturing, agriculture, power development, water supply, conservation and recreation. The end result of this discussion is conclusive indication that an interdisciplinary approach of both engineering and research must be coupled with a high degree of international coordination and cooperation to insure the optimal development of the many aspects of the Great Lakes water resources. (See also W71-07565) (Murphy-Rutgers)
W71-07567

COMMERCIAL NAVIGATION ON THE GREAT LAKES,
St. Lawrence Seaway Authority.
W. R. Mackay.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Commission of Ontario, p 89-114, 1968.

Descriptors: *Navigation, *Great Lakes, St. Lawrence River, *Economic analysis, *Canals, Technology, Transportation, Water supply, Drainage, Shipping.
Identifiers: *Commercial navigation, *Economic growth, *Economic development, Export trade, Railroads, Potash, Grain, Coal, Iron ore, Industrial development.

A history is presented of the growth of commercial navigation in the Great Lakes and St. Lawrence system from its beginning to the present. It indicates the relationship between the canal developments and the economic development and growth of the system as a whole. The historical economies of commercial navigation are juxtaposed with the historically non-competitive railroad technology which presented a far costlier alternative. Future growth possibilities for the Great Lakes system are proposed to exist in the potential development of Saskatchewan potash deposits, especially if combined with the increasing grain, coal, and iron ore traffic and the expansion of overseas trade. The author emphasizes that the value of commercial shipping to both the Canadian and American economies amounts to astronomical figures which influence both immediate and long-range export trade and the economic growth and development of both nations. (See also W71-07565) (Murphy-Rutgers)
W71-07568

CONFLICTS OF RECREATION AND OTHER USES OF THE GREAT LAKES,
Department of the Interior, Washington, D.C.
S. A. Cain.
In: Great Lakes Water Resources Conference, Toronto, Hydro-Electric Power Commission of Ontario, p 121-144, 1968.

Descriptors: *Great Lakes Region, *Fishing, *Costs, Water pollution, Planning, Watershed, Ecosystem, Streams, Lakes, Water quality, Recreation, Social aspects.
Identifiers: *Commercial fishing, *Alewife, *Cost accounting, *Total planning, Market conditions, Lamprey, Land use control.

The burden that pollution of the Great Lakes has imposed on the natural processes of renewal is considered. Particular attention is given to the conflicts of water uses in light of the alewife explosion. The conflict in this case was largely between the large profits of the alewife to the commercial fishing industry, and the dead alewife pollution of the beaches. The need for environmental awareness and the use of cost accounting which considers the ecosystem rather than only the per unit profit is called for to eliminate the high costs of water development for uses which ignore natural processes. To further this goal, the author suggests a total planning program which incorporates the full cooperation of private enterprise and government at all levels. This would enable all segments of the society to meet legitimate aspirations which would necessarily encompass a quality environment in addition to a healthy economy. (See also W71-07565) (Murphy-Rutgers)
W71-07570

STUDIES AND RESEARCH NEEDED IN REGULATION OF THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Department of Energy, Mines and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 02H.
W71-07573

NEW REQUIREMENTS IN WATER RESOURCES PLANNING ON THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
J. W. MacLaren, and R. F. Clevenger.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Power Commission of Ontario, p 361-391, 1968.

Descriptors: *Great Lakes, *Water resources development, *Optimization, Water supply, Navigation, Hydropower, Irrigation, Agriculture, Fisheries, Recreation, Erosion, Watershed, Pollution, R and D, Government, Population, Technology.
Identifiers: *International Joint Commission, *Economic development, *Great Lakes Basin Commission, Power development.

A survey is presented of current conditions on the Great Lakes, stressing the multiple uses of the resource and the inter-effect of the various uses. The type of action needed for planning that permits optimum development of the resources on both the Canadian and United States sides of the border is discussed, particularly in light of the economic value of the resource to both economies. There is a discussion of such problems as water supply, water quality, waste disposal, navigation, power development, agricultural irrigation, fisheries, and recreation. A comprehensive plan for the staged development of the water resources of the Great Lakes is presented which attempts to determine the importance of the resource in economic development, the need for government support, the future requirements of the resource, and balanced utilization of available resources. Various suggestions are proposed for the implementation of such a plan, referring specifically to the Great Lakes Basin Commission and the International Joint Commission as monitoring agencies. (See also W71-07565) (Murphy-Rutgers)
W71-07574

ORGANIZATION AND PLANNING OF WATER QUALITY CONTROL,
Ontario Water Resources Commission, Toronto.
W. A. Steggles.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 449-470, 1968.

Descriptors: *Water quality, *Great Lakes, *Water management, Government, Pollution, Drainage basin, Rivers, Sewers, Transportation, Population, Chloride, Waste treatment, Streams, Erosion, Canals.
Identifiers: *Quality control policy, *Economic incentives, Gross products.

The growing pollution problems of the Great Lakes are indicated; such problems are controllable by suitable planning, regulation and other procedures. This end could best be achieved by coupling water quality goals with economic incentives to reduce pollutants at the source. Greatly improved water pollution control technology is needed as the technology, economy, and standard of living increase in the Great Lakes area, as shown by such examples as gross products, human and animal populations, seaway and canal traffic, chloride content of lakes, and nutrients in Lake Erie. The three major areas of concern for appropriate water management are proposed as development of plans for optimal water use, study of tolerance for waste water, and a watch to detect unusual waste spills and overloads from treatment facilities. Various water quality objectives and standards are surveyed from both the Canadian and US viewpoints, and suggestions are presented for implementation of the new policies. (See also W71-07565) (Murphy-Rutgers)
W71-07576

SUGAR CANE IRRIGATION: A CASE STUDY IN CAPITAL BUDGETING,
McKinsey and Co., Inc., San Francisco, Calif.
Robert R. Champion, and George R. Glaser.
Management Science, Vol 13, No 12, B-781-B796, Aug 1967.

Descriptors: *Irrigation systems, Economic efficiency, Operating costs, Water supply, Operation research, Interest rate.
Identifiers: *Capital budgeting, Opportunity cost, Sensitivity analysis, Net Present Value, Payback, Cash flow.

This irrigation economics study is designed to recommend, on an agronomic and economic basis, a program for investing large amounts of capital in automatic and semiautomatic irrigation systems. Although this is a capital budgeting problem, the application of investment techniques was complicated by a wide range of climatic, topographic and agronomic conditions. The author considered

nomogeneous fields as blocks in order to reduce he number of investment alternatives. Then alter- native irrigation systems were evaluated on a block-by-block basis using an investment analysis model and sensitivity tests. For ranking the returns of each alternative, the author used criteria of Net Present Value years to payback and source of water contribution. The analysis then proceeded with the estimates of costs and savings attributable to each alternative. (Siegenthaler-Rutgers)
W71-07578

EQUITY AND EFFICIENCY IN PUBLIC GOODS SUPPLY,
Dalhousie Univ., Halifax (Nova Scotia).
John G. Head.
Public Finance, Vol XXV, No 1, p 24-37, Nov 1970.

Descriptors: *Economic efficiency, Welfare economics, Resource allocation, Taxes.
Identifiers: *Equity, Social welfare function, Income redistribution, Public goods, Lump sum tax, Pareto criterion.

This paper considers Musgrave's treatment of the relationship between equity and efficiency in public goods supply. The two step framework for welfare maximization assumes an ideal income distribution and on the basis of this income distribution, public goods would be provided in accordance with individual preferences using a voluntary system of tax-prices. Musgrave finds that there is an indeterminary in public goods supply. The author suggests that this indeterminary does not exist and that Musgrave's conclusion as derived from the assumption that an initial ideal income distribution guarantees that the final distribution of welfare after public goods are supplied is also ideal. However, a formal solution to the problem of public goods supply is possible only if the ideal income distribution is defined in terms of the welfare maximum achieved after public goods have been supplied. The author finds that Musgrave's approach is equivalent to the social welfare function method but is more conducive to operationalization. This paper is relevant to water research concerned with the role equity and efficiency criteria in policy making. (Siegenthaler-Rutgers)
W71-07583

ON THE APPLICATION OF CARDINAL UTILITY THEORY TO ENGINEERING ECONOMIC ANALYSIS,
University of Southern California, Los Angeles.
Gerald Fleischer, and Robert H. Cremer.
The Engineering Economist, Vol 16, No 2, p 117-130, Winter 1971.

Descriptors: *Economic evaluation, Decision making, Cost-benefit analysis, Risk, Probability, Interest rate, Marginal utility, Discount rate.
Identifiers: *Cardinal utility, Cash flow, Rate of return, Present worth.

This paper considers the integration of cardinal utility concepts into the engineering economy methods of analysis and evaluation that are based on the manipulation of cash flow. The traditional concern with monetary quantities in the cash flow method is an oversimplication of relative project worth because the net utility of the project to the investors is neglected. The author outlines several of the key problems associated with establishing a specific utility function and suggests procedures for dealing with these difficulties when they occur in the public and private sectors. Several research questions are pointed out as needing further study; however, the author concludes at present a sufficient state of refinement does exist to include elements of utility theory into a conceptual framework for limited operationalism. This article is relevant to water research concerned with project evaluation and decision making. (Siegenthaler-Rutgers)
W71-07584

THE CONSIDERATION OF RISK AND UNCERTAINTY IN CAPITAL INVESTMENT ANALYSIS,
North Carolina State Univ., Raleigh.
J. R. Canada.
Management International, Vol 7, No 6, p 47-55, Dec 1967.

Descriptors: *Risk, Decision making, Economic evaluation, Budgeting, Mathematical model.
Identifiers: *Capital budgeting, Statistical decision theory, Risk discounting, Sensitivity study, Decision tree, Probabilistic monetary model.

This article surveys a wide variety of approaches or procedures that can be used to consider risk and uncertainty in capital budgeting analysis. The approaches are categorized into two groups according to the degree of sophistication involved. The basic traditional approaches discussed are assumed certainty, conservative adjusting, risk discounting, and sensitivity study. The author finds these related approaches to be quite limited in dealing with the consideration of risk. More advanced approaches such as the probabilities monetary, method, the decision tree, expected utility, and statistical decision theory are found to be more effective. The author concludes that these methods need further testing but do serve as a valuable supplement to administrative judgment. This article is relevant to water research concerned with project evaluation and water investment analysis. (Siegenthaler-Rutgers)
W71-07585

AN ANALYSIS OF APPLICATIONS OF THE UTILITY CONCEPT,
San Fernando Valley State Coll., Northridge, Calif.
Ernest H. Weinwurm.
The Engineering Economist, Vol 16, No 2, p 131-139, Winter 1971.

Descriptors: *Decision making, Risk, Economic evaluation, Mathematical model.
Identifiers: *Utility function, Opportunity cost, Planning-programming-budgeting, Subjective probability, Capital investment.

This paper considers the application of risk analysis and utility or preference theory to decision making models. The author first considers the conversion of qualitative data obtained from subjective behavior of managers to quanitative data. Then, the concept of risk analysis and utility theory is outlined along with a number of applications. The final section of the paper focuses on a recent study concerned with the explicit consideration of uncertainty in capital investment analysis. The approach is largely based on the normative decision model that combines subjective probability with the Von Neumann and Morgenstern utility theory. The author claims that two important improvements in the corporate decision process could result from a risk policy. First, it would help to avoid opportunity costs from rejecting prematurely risky projects and second it permits interpretation of risk information while satisfying the goal of maximizing expected utility. This article is relevant to budgeting and capital studies concerned with incorporating risk into water investment decision making. (Siegenthaler-Rutgers)
W71-07586

THE SYMMETRY APPROACH TO COMMITTEE DECISIONS: AN EMPIRICAL STUDY OF A LOCAL GOVERNMENT BUDGET COMMITTEE,
Wayne State Univ., Detroit, Mich.
Karl W. Roskamp, and Gordon C. McMelkin.
Zeitschrift fur die Gesamte Staats Wissenschaft, 126, Band I, p 75-96, Jan 1970.

Descriptors: *Decision-making, Economic evaluation, Uncertainty, Budget constraint, Resource constraint, Simulation.
Identifiers: *Symmetry of loss, Cardinal utility, Social utility function, Linear transformation.

This paper is concerned with the construction of operational decision models for the simulation of committee decisions. The authors present an empirical test of a modified version of the symmetry of loss approach using data from a local government's budget committee. This method permits one to derive from given individual cardinal utility functions a social utility function or committee utility function. Individual committee members were asked about their preferences with respect to budget size and composition and from these input, hypothetical budgets were generated using the symmetry of loss method. Comparison of the generated budget to the actual budgets revealed a high level of accuracy. The authors conclude that the symmetry approach should generate expenditure distributions close to actual results if the budget constraint is known or carefully estimated and if strategies and tradeoffs are considered. This paper is relevant to water research concerned with the decision making process and the expenditure implications of water investment decisions. (Siegenthaler-Rutgers)
W71-07588

SELECTING REGIONAL INFORMATION FOR GOVERNMENT PLANNING AND DECISION-MAKING,
California Univ., Los Angeles.
Werner A. Hirsch, and Sidney Sonenblum.
New York, Praeger, 1970. 198 p.

Descriptors: *Decision-making, Regional analysis, Economic evaluation, Cost-benefit analysis, Program budgeting, Economic efficiency, Resource allocation.
Identifiers: *Subnational information design, Social welfare, Horizon scanning.

This book is a revised version of one prepared for a Conference of the Committee on Regional Accounts of the Resources for the Future held in 1968. The purpose of the study is to develop a Subnational Information Design (SID) that will facilitate improved decisions at the state and national level. The information design is aimed at facilitating two kinds of decisions: horizon scanning decisions and preferred solution selection decisions. To assist the decision maker in horizon scanning decision-making, the information system can perfect alternative futures and also highlight the potential areas of concern. The analytical tool for preferred program selection is benefit-cost analysis within a program budgeting framework. The information system should be designed to aid in the development of a program budget and in the calculation of costs and benefits. The authors also describe the construction, mechanics, and alternative uses of an information retrieval system by decision-makers. This book is relevant to water planners concerned with the role of information systems in policy and program decisions. (Siegenthaler-Rutgers)
W71-07589

ON THE ASSESSMENT OF RISK,
Pennsylvania Univ., Philadelphia.
Marshall E. Blume.
The Journal of Finance, Vol XXVI, No 1, p 1-10, Mar 1971.

Descriptors: *Risk, Economic evaluation, Forecasting, Regression analysis, Covariance, Correlation.
Identifiers: *Beta coefficient, Portfolio approach, Bias, Capital budgeting.

This paper examines the statistical properties over time of one measure of risk, the coefficient of nondiversifiable risk (or the beta coefficient in investment analysis). The author defines the beta coefficient and presents a justification of its use as a measure of risk based on the empirical validity of the market model. After discussing the sample and its basic properties, the author examines the stationarity of this beta coefficient over time and then proposes a method of obtaining improved assessments of this measure of risk. The results of the em-

pirical analysis show a tendency for the estimated values of the risk measures to regress toward the mean. The author uses historical rates of regression for Beta to adjust the assessments for future risk coefficients and finds an improvement in the accuracy of the measurement of risk. This article is relevant for water studies concerned with the selection of alternative risky water investment projects. (Siegenthaler-Rutgers)
W71-07590

PORTFOLIO ANALYSIS, STOCK VALUATION AND CAPITAL BUDGETING DECISION RULES FOR RISKY PROJECTS,
New York Univ., N.Y.
Richard C. Stapleton.
The Journal of Finance, Vol XXVI, No 1, p 95-117, Mar 1971.

Descriptors: *Decision making, *Risk, Economic evaluation, Interest rate, Regression analysis, Economic efficiency.
Identifiers: *Capital budgeting, Net discounted value, Cash flow, Portfolio theory, Rate of return.

This paper derives capital budgeting decision rules based on stock value models derived within a portfolio framework when cash flows resulting from the acceptance of projects are risky. The stock value theory is used to derive optimal decision rules for the evaluation of individual capital projects. The decision rules are in terms of a project's discounted value and rate of return. Three different approaches to project evaluation are considered. The first method uses the probability distribution of the net discounted value (NDV) or the rate of return (RR) to derive the certainty equivalent (NDV) or the certainty equivalent (RR). The second method derives the same certainty equivalent values by computing the certainty equivalent cash flows of the project. The third approach uses the expected value of the cash flows of the projects and discounts these flows at a risk-adjusted discount rate to compute the (NDV). All three approaches yield the same accept-reject decision rules. This article is relevant for water resource studies concerned with capital budgeting and project evaluation. (Siegenthaler-Rutgers)
W71-07591

THE APPLICATION OF SYSTEMS ANALYSIS TO GOVERNMENT OPERATIONS,
George Washington Univ., Washington, D.C.
Guy Black.
New York, Praeger, 1969. 186 p.

Descriptors: *Systems analysis, Cost-benefit analysis, Risk, Marginal cost, Optimization, Linear programming, Input-output analysis, Discount rate.
Identifiers: *Cost effectiveness, Feedback theory, Sensitivity analysis, Present value.

This book considers the relation between the tools of the systems approach and the structure of systems concepts as related to government operations. Three major phases of the systems approach are discussed: systems analysis, systems engineering and systems management. Systems analysis establishes optimum system characteristics, analyzes interactions and studies the characteristics of the subsystems. The author uses cost-benefit analysis for identifying optimal system designs with the benefit function representing social benefits adjusted for risk. The relationship and distinctions between systems concept and Planning-Programming-Budgeting System are made. The National Park Service is used to illustrate how systems analysis takes account of externalities for both cost and benefit. This book is relevant to water administrators and researchers concerned with program analysis in terms of cost effectiveness. (Siegenthaler-Rutgers)
W71-07592

DECISION-MAKING ON TAXATION AND EXPENDITURES,
National Bureau of Economic Research, New York.
Charles E. Lindblom.
In: Public Budgeting and Finance, Itasca, F. E. Peacock Publishers, p 287-309, 1968.

Descriptors: *Decision-making, *Taxes, *Government, *Resource allocation, Cost-benefit analysis, Budgets, Costs, Minimization, Economic analysis, Welfare economics.
Identifiers: *Government expenditures, Normative economics, Means-end calculations, Overview, Fiscal policy.

This article presents an investigation for workable norms in decision-making processes. Two types of norms are dealt with, those for taxes and those for designers of decision-making machinery. The ultimate aim of the project presented is to make possible the eventual formulation of more workable standards for government tax and expenditure decisions through a refined aspect of normative economics. Characteristics of contemporary policy-making in government expenditures and taxation are first presented, dealing with budgetary difficulties and allocation of scarce resources. Norms such as objective clarification, deliberate choice, cost minimization, reasonable cooperation, and unified decision-making for interdependent events are collated from the policy presentation. The author then cites the discrepancy between these norms and actual practices, and suggests several possible solutions to these difficulties, including incremental decision-making, the bottleneck principle of scarce resource allocation, and coordination through partisan mutual adjustment. These principles, along with the analysis of the implications for the norms and principles discussed are relevant to the planning process of direct and indirect tax based water investments. (Murphy-Rutgers)
W71-07593

BUDGETING AND DECISIONMAKING PROCESS,
Harvard Univ., Cambridge, Mass.
Arthur Smithies.
In: Public Budgeting and Finance, Itasca, F. E. Peacock Publishers, p 253-261, 1968.

Descriptors: *Decision-making, *Federal government, *Budgeting, Resource allocation, Taxes, Budgets, Planning, Uncertainty, Economic analysis.
Identifiers: Policy objectives, Programming, Budget execution, Estimates.

This article presents the relation of budgeting to the process of governmental decision-making. Almost all government decisions have budgetary implications in that they involve allocating scarce resources among alternative uses. One primary purpose of the author is to establish that the entire decision-making process is greatly improved if these choices of allocation are made both explicitly and deliberately. The other primary goal of the author is to present a comprehensive discussion of the decision-making process, particularly the budgetary aspect, from the viewpoint of the structure and procedure of a complicated organization, namely the Federal government. Principles of organization are presented that can easily be applied in analysis of the specific problem of the Federal budget. Difficulties such as uncertainty are dealt with, and suggestions for optimally effective planning are proposed. These suggestions are of interest to those in the water resource planning field relating to resource allocation. (Murphy-Rutgers)
W71-07594

REGIONAL ALLOCATION OF PUBLIC INVESTMENT,
Tokyo Univ. (Japan).
Noboru Sakashita.
In: The Regional Science Association Papers, Vol 19, p 161-182, 1967.

Descriptors: *Investment, *Regional analysis, *Economic efficiency, Model studies, Capital, Economic analysis, Social aspects, Income, Optimization, Jobs, Taxes, Time.
Identifiers: *Public investment, *Regional allocation, *Efficiency criterion, Growth patterns, *Multiregion economy, Economic variables, Externalities.

This article deals with the problems of allocation of public funds by central governments to promote regional social capital formation. Lack of efficiency in such investment is ascribed to lack of interregional industrial complementarity and the political problems of such economic allocations. Two models are proposed to evaluate the effect of regional allocation of public investment on the growth pattern of a multiregion economy. The models differ concerning the presumptions on the productivity of public investment. Three properties of the optimal solution to the regional allocation problem result from the development and explanation of the models. These properties hold that public investment is justified since it originates outside the market mechanism, that public investment should be concentrated where the change in the values of relevant parameters is minimal, and that the optimum growth plan may call for utilizing several kinds of public investment policies. This paper is relevant to the analysis of the effects of public water resource investments on a regional economies. (Murphy-Rutgers)
W71-07595

PUBLIC INVESTMENT, THE RATE OF RETURN, AND OPTIMAL FISCAL POLICY,
Resources for the Future, Inc., Washington, D.C.
Kenneth J. Arrow, and Mordecai Kurz.
Baltimore, The Johns Hopkins Press, 1970. 218 p.

Descriptors: *Economic efficiency, *Planning, *Water resource development, Taxes, Discount rate, Optimization, Rate of return, Government, Capital, Financing, Management, Risk, Investment, Returns to scale, Cost-benefit analysis.
Identifiers: *Intertemporal criteria, *Resource allocation, *Controllability, Growth theory.

This book is an effort to remedy the inadequacy of existing theory of intertemporal criteria for resource allocation. It attempts to derive criteria for such allocation from dynamic notions of efficiency and then relates them to the macroeconomic problems of stability and growth. The book achieves a formulation of the problem of public expenditure in the context of modern economic growth theory by tying the determination of the allocation of resources between public and private sectors to the goal of getting the economic system onto an efficient growth path. The theory of public expenditure is developed by presenting an exposition of modern growth theory, and then developing a new theory of 'controllability'. The latter theory explores the question of whether or not the instruments of general fiscal control are sufficient to bring about an optimal intertemporal allocation of resources in the presence of constraints imposed by private behavior. The question of 'controllability' as presented here is relevant to those involved in water resource development and planning. (Murphy-Rutgers)
W71-07596

GENERAL THEORY: SOCIAL, POLITICAL, ECONOMIC, AND REGIONAL,
Pennsylvania Univ., Philadelphia.
Walter Isard, Tony E. Smith, Peter Isard, and Tze Hsiung Tung.
Cambridge, The M.I.T. Press, 1969. 1040 p.

Descriptors: *Decision-making, Operations research, Game theory, Systems analysis, Regional analysis, Input-output analysis, Linear programming.
Identifiers: *Location theory, Cardinal utility, Objective function, Payoff, Social welfare, General equilibrium.

his book presents a general theory on the social, olitical, and economic structure and functions of gions and develops this theory in the framework f decision-making analysis. The book contains aterials of three kinds: location theory, decision eory, and general social systems theory. The thors introduce information and decision ocesses into location theory and consider the oblem of the optimal spatial allocation of infor- ation and decision-making. The game theory ap- oach to locational decision problems is also eated and illustrated with extensions beyond cost inimization and welfare maximization solutions. stead, the location analysis does not separate the oblems of distribution of gains and efficient allo- tion but considers the possibility of negotiable al- rnatives in the analysis. This book is relevant to ater studies concerned with reviewing the broad eoretical basis of decision-making techniques nd regional planning. (Siegenthaler-Rutgers)
71-07597

LANNING FOR WATER IN AN URBAN AGE,
uy J. Kelnhofer.
aper delivered at Clemson University, 12 Feb 970. 12 p.

escriptors: *Planning, *Water resources, *Ur- anization, *Management, Land resources, Coor- ination, Water supply, Technology, Communica- on, Decision-making, Manpower, Professional ersonnel.
dentifiers: *Metropolitan water resource manage- ent, Urban age.

is pointed out that America is now in an urban ge and that all types of planning must reflect this ct. This is particularly true of water planning, here a transition from a rural to an urban orienta- on need to be made. A number of salient por- ems of this transition can be identified. (1) We ust find more responsive and more efficient eans of defining the interests of metropolitan reas in the water and related land resources serv- g their communities. (2) The problem of bringing gether, under one common mangement system, ll of the related functions of water in a etropolitan area is one which becomes more ur- ent as the demand on urban water supplies in- reasingly exceeds existing management capabili- es. (3) We must find ways to put our new nowledge to use more rapidly. (4) We must roduce larger numbers of trained resource plan- ers. (5) We must find ways to communicate with he man in the street and elected officials on all evels. (6) We must devise improved systems of ublic decision-making. (Davis-Chicago)
71-07688

UANTITATIVE WATER RESOURCE BASIN LANNING: AN ANALYSIS OF THE PECOS IVER BASIN, NEW MEXICO,
lew Mexico Univ., Albuquerque. Dept. of conomics.
or primary bibliographic entry see Field 04B.
71-07691

REDICTION OF WATERSHED DEVELOP- IENT SUCCESS OF LOCAL COMMUNITIES,
Department of Agriculture, Upper Darby, Pa. conomic Research Div.
. Thomas Cox.
Reprint, In: International Conference on WATER OR PEACE, May 23-31, 1967. 15 p, 3 tab, 5 ref.

Descriptors: *Methodology, *Planning, Watershed management, Water resources development, Social aspects, Political aspects, Community development.
Identifiers: *Discriminant analysis, Community performance.

Few analyses have been made of the performance of communities engaged in water development projects within a free society. It is usually assumed that, once informed of the possible benefits, local citizens will quickly adopt proposed water development projects. In order to investigate this assumption an analysis of the differences in performance of local communities in achieving developmental goals was undertaken. The discriminant analysis technique utilized provides a method of classification of watersheds into groups representing fast to slow accomplishment of watershed development. It provides a test of significance of these groupings. It also provides classification coefficients to predict, based upon the performance of the original sample, the behavior of subsequent watersheds for which data on the same variables are available. Investigation of the classified watersheds according to type of sponsorship and pattern of relationships among certain variables or measures should help explain why some of the socio-economic variables affect rate of progress in watershed development. Recommendations as to type of sponsorship given certain relationships can then be advanced for future development projects. (Davis-Chicago)
W71-07694

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME I, THE LONG RUN EFFECTS OF WATER PRICING POLICIES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06A.
W71-07059

SOME ASPECTS OF WATER PRICING IN NON-INDUSTRIAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Economics.
C. W. Fristoe, F. O. Goddard, and N. G. Keig.
Land Economics, Vol 47, No 1, p 87-92, Feb 1971. 4 ref, 1 fig.

Descriptors: *Rates, Municipal use, Sprinkler irrigation, Lawns, Cost allocation.

In attempting to discuss ways of dealing with the effect of lawn irrigation on water pricing and cost, the authors advocate water use restrictions in order for water utilities to pursue a policy of charging the users of a water service the full cost of supplying it. Since lawn sprinkling substantially raises the maximum day and peak-hour rates of water delivery as well as concentrating the highest levels of water consumption into one season, imposing restrictions on the use of water for lawn irrigation 'would best promote the public interest.' (Holmes-Rutgers)
W71-07496

COST OF PUMPING IRRIGATION WATER IN ARIZONA: 1891 to 1967,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
Thomas Archer, and William E. Martin.
Water Resources Research, Feb 1971, Vol 7, No 1, p 23-31. 5 fig, 1 tab, 32 ref.

Descriptors: *Irrigation practices, Operating costs, Water rates, Cotton, *Arizona.
Identifiers: Pinal County (Ariz), Agricultural Experiment Station.

The historical record of the cost of pumping groundwater in Arizona is examined. Costs are presented in actual dollars and dollars adjusted by GNP implicit price deflators. Whereas pumping depths have been rising rapidly, costs per acre-foot per foot of lift have been falling, adjusted costs per acre-foot have been almost constant, and per acre costs and total farm costs relative to both total costs and total returns have fluctuated throughout the time period examined, sometimes being lower but often being higher than costs at the present time. (Holmes-Rutgers)
W71-07501

ECONOMIC ANALYSIS OF SEWER SERVICE CHARGE FORMULAS,
McMasters Univ., Hamilton (Ontario). Dept. of Economics.
J. A. Johnson.
Land Economics, Feb 1971, Vol 47, No 1, p 80-86. 1 tab, 8 ref.

Descriptors: *Sewage systems, Economics, *Cost comparisons, *Rates, Evaluation, Costs.
Identifiers: *Joint Committee Formula, *Sewer service charge.

This paper analyzes the most important types of sewer service charge formulas. It judges these six different types in terms of equity, economic efficiency, revenue adequacy, and administrative simplicity. The advantages and disadvantages of each type of system for different municipalities are described and analyzed. (Holmes-Rutgers)
W71-07502

A GROWING MARKET FOR WATER AND WASTE WATER TREATMENT EQUIPMENT,
For primary bibliographic entry see Field 05D.
W71-07539

FUNDING FOR AGRICULTURAL WASTE RESEARCH,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 05D.
W71-07554

EFFLUENT CHARGES: A METHOD OF ENFORCING STREAM STANDARDS,
Maine Univ., Orono.
Orlando E. Delogu.
Maine Law Review, Vol 19, p 29-47, Jan 1967.

Descriptors: *Water pollution control, Water quality, Pollution abatement, Resource allocation, Sewer treatment facility, Water supply.
Identifiers: *Effluent charge, Stream standard, Externalities, User charge, Transfer payment.

The use of effluent charges are considered a means of achieving stream standards defined by the state and Federal government. The effluent charge system would shift the cost burden of the presently employed means of waste disposal from the state and downstream users to the economic unit creating the waste product. The effluent charge system corrects the market distortions created by the present system of waste disposal but it does not improve water quality. The author suggests that effluent charges can be used to achieve water quality standards by using the money collected from effluent charges for the construction and operation of sewer treatment facilities. This modified effluent charge proposal combines the state's power to tax with the municipal waste land surcharge to provide an enforcement mechanism for the achievement of water quality standards. (Siegenthaler-Rutgers)
W71-07577

6D. Water Demand

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 03B.
W71-07064

WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W71-07135

THE ARIZONA LETTUCE INDUSTRY: COMPETITION, PRICES, DEMAND, SUPPLY CONTROL,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W71-07162

WATER RELATED LAND USE IN THE WEBER RIVER DRAINAGE AREA,
Utah Dept. of Natural Resources. Div. of Water Rights.
For primary bibliographic entry see Field 04A.
W71-07167

WATER AND SEWER PLAN AND PROGRAM, 1970.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 05D.
W71-07202

WATER FOR CALIFORNIA--OUTLOOK IN 1970.
California State Dept. of Water Resources, Sacramento.

Available from: State of California, Documents Section, PO Box 20191, Sacramento, Calif, 95820, Price $5.00. California Department of Water Resources Bulletin No 160-70, Dec 1970. 179 p, 42 fig, 2 plate, 14 tab.

Descriptors: *Water resources development, *California, *Projects, *Reviews, Planning, Evaluation, Water quality, Urbanization, Land development, Economics, Agriculture, Recreation, Population, Legislation, Wildlife, Electric power demand, Surface waters, Groundwater, Hydrogeology, Watershed management.

Appraisals of water demands for various beneficial purposes throughout the State of California for 1990 and 2020, and the potential sources of water supplies to satisfy those demands are presented. Accomplishments in both planning and water development implementation in the four years since 1966 is discussed. Urban land use is expected to nearly double from 2.3 million acres at present to about 4.5 million acres in 2020 to accommodate the projected population of 45 million. Statewide urban water demands are expected to increase from about 3.7 million acre-feet at present to 6.4 million acre-feet in 1990 and 10.3 million acre-feet in 2020. Overall per capita water demands are expected to increase some 20 percent by 2020. Demands for agricultural water will increase from 24.4 million acre-feet at present to 27.4 million acre-feet in 1990, and 28.7 million acre-feet in 2020. All major urban areas have adequate water supplies from existing projects or facilities authorized or under construction to meet water demands for the next 20 or more years. (Woodard-USGS)
W71-07296

HYDRO-ELECTRIC POWER DEVELOPMENT ON THE GREAT LAKES SYSTEM,
Hydro-Electric Power Commission of Ontario, Toronto.
For primary bibliographic entry see Field 06B.
W71-07566

6E. Water Law and Institutions

THE UNIVERSITY'S ROLE IN NATIONAL WATER POLICY.
For primary bibliographic entry see Field 06B.
W71-07183

THE LAW PERTAINING TO ESTUARINE LANDS IN SOUTH CAROLINA,
William A. Clineburg, and John E. Krahmer.
South Carolina Law Review, Vol 23, No 1, p 7-24, 1971. 68 ref.

Descriptors: *South Carolina, *Estuaries, *Coastal marshes, *Tidal marshes, Estuarine environment, Estuarine fisheries, Tides, Salt marshes, Marsh management, Land tenure, Legal aspects, Water law, Administration, Administrative agencies, Phosphates, Fishing, State governments.

Evaluated in this article is the law relating to estuarine lands in South Carolina. Estuarine areas are defined as those coastal areas where fresh water from the land meets the salt water of the sea with a daily tidal flow. Estuarine fishing, residential development, and phosphate mining are discussed. The historical development of the law of estuarine ownership during the following periods is examined: (1) under English common law, (2) the colonial period, (3) 1777-1928, (4) 1928-1951, and (5) 1952-1969. In South Carolina estuarine lands are owned by the state, and they are not subject to sale by the Budget and Control Board. They probably are not subject to general sale by the legislature. The legislature can confirm titles to individual pieces of estuarine land and may be able to sell specific tracts by special acts. The problem of managing these lands is complex as there are eight state agencies now administering various aspects of this land. Several agencies of the federal government have duties of control which affect estuarine lands in South Carolina. The author concludes by recommending reorganization of the present administrative structure, perhaps creating a single agency with authority over estuarine lands. (Robinson-Florida)
W71-07208

SUBSIDENCE RESULTING FROM THE REMOVAL OF GROUNDWATERS,
Robert H. Steelhammer, and John G. Garland.
South Texas Law Journal, Vol 12, No 2, p 201-213, 1970. 88 ref.

Descriptors: *Land subsidence, *Percolating water, *Damages, *Water sources, Settlement (Structural), Withdrawal, Subsidence, Percolation, Underground streams, Subsurface waters, Underground, Legal aspects, Water law, Underflow, Groundwater basins, Water rights, Land tenure.

Evaluated in this article are the legal aspects of the problem of subsidence resulting from the removal of underground waters. All underground waters are presumed to be percolating waters in the absence of contrary evidence. There are two conflicting legal doctrines dealing with percolating waters. The English Rule considers percolating water as much a part of the freehold as minerals, and the owner, in the absence of malice, has the absolute right to intercept the water regardless of any effect on his neighbor's land. The American Rule requires that the use of percolating waters must be reasonably necessary for some beneficial purpose. The application of these rules is discussed in light of several cases. Generally each landowner is entitled to lateral support of his neighbor's land irrespective of negligence. The Restatement of Torts has adopted a provision stating that one who is privileged to withdraw underground water is not for that reason privileged to cause a subsidence of the others land. The damages for such a subsidence are the natural, ordinary, or reasonable consequences of the removal of subjacent support. The author concludes that the Restatement position is a valuable step forward. (Robinson-Florida)
W71-07209

ADJUDICATION OF FEDERAL RESERVED WATER RIGHTS,
John C. Guadnola.
University of Colorado Law Review, Vol 42, No 2, p 161-172, 1970. 64 ref.

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Federal jurisdiction, *State jurisdiction, Water rights, Colorado, Legislation, Water supply, Legal aspects, Judicial decisions, Conservation, Appropriation, Appropriation doctrine, Preferences (Water rights), Priorities, Adjudication procedure, Water utilization, Consumptive use, Land.
Identifiers: *McCarran Amendment.

Recently, the Supreme Court of Colorado in United States v. District Court (458 P 2d 760, cert. granted, 38 U.S.L.W. 3379 (U.S. Mar. 30, 1970, No. 1178) asserted jurisdiction to adjudicate federal reserved water rights. This note discusses the Colorado decision, offering support for its holding on the jurisdiction issue and suggesting a way in which any decision on the merits can accommodate the interests of private appropriators and the federal government. The principle obstacle to jurisdiction over federal water rights is sovereign immunity. The only federal legislation waiving such immunity is the McCarran Amendment (43 U.S.C. S 666, 1964), of rights to waters of river systems or other sources, or (2) where the United States owns or is in the process of acquiring water rights by one of several enumerated methods and is a necessary party. The note first considers the Colorado court's reasoning in finding jurisdiction and finds it inadequate. The author then puts forward his own theory, arguing chiefly that since reserved rights are open-ended, private appropriators should have recourse to state adjudication concerning the future availability of water. Nevertheless, state courts must be careful to protect federal interests. The note concludes with a discussion on how this can be accomplished. (Duss-Florida)
W71-07210

PERMITS FOR DISCHARGES OR DEPOSITS INTO NAVIGABLE WATERS.
Corps of Engineers, Washington, D.C.

Federal Register, Vol 36, No 56, Tuesday, March 23, 1971, p 5431-5432.

Descriptors: *Navigable waters, *Permits, *Water pollution, *Regulation, Administration, Federal government, Legislation, Water pollution sources, Water quality, Public health, Water pollution control, Inspection, Environment, Environmental effects, Water Quality Act, Administrative agencies, Water quality control.

In this entry in the Federal Register, the Department of the Army, Corps of Engineers, sets forth proposed regulations for issuance of permits for discharges or deposits into navigable waters. The draft permit first identified the nature of the deposit or discharge approved and any limitations on its character or quality. General conditions governing the permit outline regulations, policies and procedures to be followed by permittees. Penalties that can be invoked upon violation of terms and conditions of permits are listed. Permittees shall comply with applicable state or federal water quality standards. Procedures to be followed when water quality standards become more rigorous are outlined. Permittees shall comply with any regulations or directives issued by the Administrator of the Environmental Protection Agency and with recommendations of any enforcement conference held pursuant to the Federal Water Pollution Control Act. Provisions cover inspection of discharge facilities by the Corps and records to be kept by permittees. The public shall have access to all information concerning specific permits. Other provisions cover: (1) taxation or charges on deposits or discharges; (2) prohibition of construction of facilities on navigable waters; (3) suspension, modification or revocation of permits; and (4) duration of permits. (Duss-Florida)
W71-07211

GRANTS FOR WATER POLLUTION CONTROL.
Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 36, No 59, Friday, Mar 26, 1971, p 5713.

escriptors: *Water pollution control, *Water pollution, *Waste treatment, *Government finance, reatment facilities, Waters pollution treatment, osts, Regulation, Administrative agencies, Administration, Water quality, Environment, Cities, lunicipal wastes, Water pollution sources.
lentifiers: *Environmental Protection Agency.

n this entry in the Federal Register, The Environental Protection Agency (EPA) serves notice iat it proposes to amend its regulations to stablish regulations for the administrator of the PA to reallocate funds appropriated for states for onstruction of waste treatment facilities. The first art of the amendment presents formulas for deterining the amount of the allotment to be given dur- g the fiscal year. The second part of the amendent concerns the reallotment of funds to states here they have not been obligated within the time pecified by law. Procedures which states must folw in order to be entitled to any reallotment are utlined. Prior to making any reallotment, the Adinistrator may determine whether any nobligated funds should be applied to situations of pecial need. In making such a determination the dministrator shall consider the extent: (1) of egradation of water quality, (2) of financial need, 3) of degradation attributable to untreated or inadequately treated waters of municipalities, (4) to hich facilities to be constructed will contribute to ie enhancement of the environment, and (5) ther relevant factors. (Duss-Florida)
/71-07212

INANCIAL RESPONSIBILITY FOR OIL POLUTION CLEANUP.
ederal Maritime Commission, Washington, D.C.

ederal Register, Vol 36, No 59, p 5751 (Mar 971). 1 p.

escriptors: *Water pollution sources, *Water polition control, *Oil, *Regulation, Administrative gencies, Administration, Federal government, egislation.
lentifiers: *Federal Water Pollution Control Act.

n this entry in the Federal Register, the Federal laritime Commission states that any vessel subject the financial responsibility provisions of the ederal Water Pollution Control Act and its implenenting regulations will be deemed to be in subantial compliance with these requirements if it as filed an application for a Certificate of Finanial Responsibility and submitted required vidence even if it does not carry its certificate on oard. The notice lists information which masters f vessels without certificates aboard should have vailable for the Commission. (Duss-Florida)
/71-07213

INANCIAL RESPONSIBILITY FOR OIL POLUTION CLEANUP.
ederal Maritime Commission, Washington, D.C.

ederal Register, Vol 36, No 59, Friday, Mar 26, 971, p 5703-5704.

escriptors: *Administrative agencies, *Administration, *Oil, *Ships, Water pollution sources, Vater pollution, Water pollution control, Legislaon, Federal government, Costs, Regulation.
lentifiers: *Federal Water Pollution Control Act.

Under the Federal Water Pollution Control Act as mended (84 Stat. 97), owners or operators of hips of certain sizes must have evidenced financial esponsibility for potential oil pollution cleanup osts. The Federal Maritime Commission has uthority to promulgate rules and regulations imlementing this requirement and in this entry the Commission sets forth amendments to regulations elating to certification of financial responsibility. The first amendment relaxes the requirement that ertificates be carried on board vessels. The new ule requires that where it is physically impossible o carry the certificate on board the vessel, the certificate number shall be displayed on both bows of the vessel or barge. The second amendment provides for issuance of master certificates to an owner's or operator's entire fleet of vessels. This amendment provides that in lieu of separate certificates persons owning or operating vessels as builders, scrappers, or sellers may apply for a master certificate to cover all vessels up to a specified individual vessel tonnage. Procedures are outlined for complying with this rule. (Duss-Florida)
W71-07214

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07215

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.

Federal Register, Vol 35, No 204, Tuesday, Oct 20, 1970, p 16374-16375.

Descriptors: *Oily water, *Pollution abatement, *Water quality control, *Water pollution control, Oil, Oil wastes, Pollutants, Administration, Administrative agencies, Administrative decisions, Regulation, Federal government, Navigable waters, Navigation, Water quality, Water pollution, Legal aspects, Financing.

Pursuant to the Water Quality Improvement Act of 1970, the Secretary of the Federal Maritime Commission proposes this regulation dealing with financial responsibility for oil pollution cleanup. Every application for a Certificate of Financial Responsibility shall be accompanied by an application fee of $100 which is non-refundable. A certification fee is also required for each vessel; this fee shall be either $5.00, $10.00, $15.00, or $20.00 depending on the size of the vessel. Fees are to be made payable in United States dollars and may be paid by check, draft, or postal money order made payable to the Federal Maritime Commission. (Robinson-Florida)
W71-07216

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Federal Register, Vol 35, No 227, Saturday, November 21, 1970, p 17944-17946. 2 tab.

Descriptors: *Oily water, *Pollution abatement, *Water pollution control, *Water quality control, Oil, Oil wastes, Pollutants, Regulation, Administration, Administrative decisions, Administrative agencies, Federal government, Water policy, Water pollution, Water quality, Navigable waters, Navigation, Legal aspects.

Pursuant to the Federal Water Pollution Control Act as amended by the Water Quality Improvement Act of 1970, providing for prevention, cleanup, enforcement, and penalties relating to the discharge of harmful amounts of oil into navigable waters of the United States, the Commandant of the Coast Guard herein promulgates procedures to be followed in the event of such discharges. The Coast Guard has been delegated the authority to assess civil penalties for violation of the statutue or regulations. Any Coast Guard commissioner, warrant, or petty officer is authorized to enforce these regulations. Any person in charge of a vessel or onshore or offshore facility shall notify one of the following officials immediately upon learning of a harmful discharge: (1) the commanding officer of any nearby Coast Guard unit, (2) the commander of the appropriate Coast Guard District, or (3) the federal official designated as the on-scene commander for spill-response purposes. If none of the above can be reached, then either the Commandant of the Coast Guard or the Regional Director of the Federal Water Quality Administration shall be notified. Addresses and phone numbers of certain concerned officials are listed. (Robinson-Florida)
W71-07217

DISCHARGE OF OIL.
Federal Register, Vol 35, No 177, Friday, September 11, 1970, p 14306-14307.

Descriptors: *Oily water, *Pollution abatement, *Water pollution control, *Water quality control, Oil wastes, Oil, Pollutants, Regulation, Administration, Administrative agencies, Administrative decisions, Navigable waters, Water pollution, Water pollution sources, Water quality, Water resources, Legal aspects, Federal government.

Pursuant to section 11 (6) (3) of the Federal Water Pollution Control Act, these regulations pertaining to the discharge of oil are adopted. The regulations apply to the discharge of oil into or upon the navigable waters of the United States or the contiguous zone. Harmful discharges include those which: (1) violate applicable water quality standards, (2) discolor or cause a film or sheen upon the water, or (3) cause a sludge to be deposited beneath the surface of the water. No person shall discharge or cause to be discharged any oil in harmful quantities into the navigable waters of the United States or the contiguous zone. Discharges of oil from a properly functioning vessel engine are not considered harmful, but oil accumulated in the bilges is not exempt. The addition of dispersants or emulsifiers to discharged oil, which would circumvent those regulations, is prohibited. Any person in charge of any vessel or onshore or offshore facility shall notifiy the Coast Guard immediately upon learning of any prohibited discharge. (Robinson-Florida)
W71-07218

ENVIRONMENTAL EDUCATION ACT (NEED FOR EDUCATION CONCERNING ENVIRONMENTAL QUALITY AND ECOLOGICAL BALANCE).
Pub L No 91-516, 84 Stat 1312, 13 US Code Cong and Admin News, p 5353-5357 (1970). 5 p.

Descriptors: *Environment, *Environmental effects, *Education, *Administration, Administrative agencies, Federal government, Legislation, Ecology, Balance of nature, Pollution, Technology, Rural areas, Community development, City planning, Population, Conservation, Resources, Resource development, Government finance, Projects, Public health.

Because of the deterioration in the quality of our environment and its ecological balance, the threat this poses to the public, the poor understanding of the public about environmental issues, and the presently inadequate resources for educating the public about environmental quality, Congress herein enacts the Environmental Education Act. The Act's purpose is to provide broad support for educational programs and projects designed to inform the public about the environment and to enhance environmental quality and maintain the ecological balance. The Act establishes within the Office of Education an office of environmental education to administer the programs authorized by this legislation. Environmental education is defined as the educational process dealing with man's relationship to his natural and manmade surroundings. This includes the relationship between: (1) population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning and (2) the total human environment. Provisions authorize the making of grants for education projects and describe activities qualified for funds and criteria for approval of applications for financial assistance. An Advisory Council on Environmental Education is established to assist in the administration of the Act. Other provisions deal with technical assistance by federal agencies, small grants, and authorized appropriations. (Duss-Florida)
W71-07219

LEGISLATION FACILITATING NEGOTIATION OF AN INTERSTATE COMPACT RESPECTING THE HUDSON RIVER.
Pub L 89-605, 80 Stat 847-849 (1966). 3 p.

Descriptors: *Hudson River, *Interstate compacts, *New York, *New Jersey, Vermont, Connecticut, Massachusetts, Rivers, Running waters, Surface waters, Interstate rivers, Legal aspects, Federal government, State governments, Local governments, Water pollution control, Water utilization, Water resources, Water resources development, Legislation.

Under this federal statute the states of New Jersey, Vermont, Massachusetts, and Connecticut may negotiate with each other and the United States for the purpose of establishing a compact dealing with the preservation, restoration, utilization, and development of the natural, scenic, historic, and recreational resources of the Hudson River. The Secretary of the Interior shall represent the United States in such negotiations and report to the President not later than July 1, 1968. In negotiating the compact the following shall be considered: (1) encouragement of all beneficial uses of the lands and waters of the riverway; (2) encouragement of local and state autonomy in planning and action; (3) the need to abate water pollution; (4) the need to preserve, enhance, and rehabilitate the scenic beauty of the riverway; (5) the need to protect fish and wildlife; and (6) the need to preserve and develop archeological and historic sites. All departments, agencies, and instrumentalities of the United States shall consult with the Secretary of the Interior concerning any plans affecting the Hudson River until such time as the states and the United States have had an opportunity to negotiate a compact. (Robinson-Florida)
W71-07220

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
H R Rep No 127, 91st Cong, 2d Sess, 4 US Code Cong and Admin News p 809-830 (1970). 22 p.

Descriptors: *Water quality control, *Environment, *Administrative agencies, *Pollution abatement, Pollutants, Oil, Oil industry, Water pollution, Water pollution control, Water pollution sources, Water quality, Administration, Federal government, United States, Ships, Sewage, Sewage disposal, Legislation, Legal aspects, Ecology.
Identifiers: *Water and Environmental Quality Improvement Act of 1970.

The legislative history of the Water and Environmental Quality Improvement Act of 1970 is set forth in this House report. Part I of the report discusses the problems to be corrected by the legislation, while part II delineates the effect of specific sections of the Act. The first topic discussed concerns the control of pollution by oil and other matter, noting the Torrey Canyon disaster and the Santa Barbara Channel oil spills and determining that present legislation is inadequate to deal with such situations. A discussion of oil pollution considers the effect of the Act upon financial responsibility and liability for oil spills. The topic dealing with control of sewage from vessels shows committee awareness of the antiquity of vessels in the United States merchant fleet and allows a reasonable margin for such vessels to continue operation under the new standards. The remaining topics are concerned with area acid and other mine water control demonstrations and cooperation by federal agencies pollution control, including appropriations for the new program. Part II provides a section-by-section explanation of the bill as it pertains to each of the foregoing problem areas, and contains a section on training personnel in water quality control. (Hart-Florida)
W71-07221

ENVIRONMENTAL FINANCING ACT OF 1971 (A BILL TO ESTABLISH AN ENVIRONMENTAL FINANCING AUTHORITY TO ASSIST IN THE FINANCING OF WASTE TREATMENT FACILITIES).

Senate Bill 1015, 92d Cong., 1st Sess (1971). 11 p.

Descriptors: *Construction costs, *Waste treatment, *Treatment facilities, *Government finance, Water pollution control, Pollution abatement, Legislation, Federal government, State governments, Local governments, Cities, Administration, Cost sharing, Cost repayment, Capital costs, Financing, Interest, Debt, Loans, Repayment contracts, Government supports, Grants, Administrative agencies, Legal aspects.
Identifiers: *Water Pollution Control Act, *Environmental Financing Act.

The Environmental Financing Act of 1971 would assure that the inability to borrow necessary funds on reasonable terms does not prevent any state or local public body from carrying out projects for construction of waste treatment works. An Environmental Financing Authority would be established and authorized to purchase, on terms and conditions determined by the Authority, any obligation which is issued by a state or local public body to finance the non-federal share of the cost of any project for the construction of waste treatment works which have been determined to be eligible for federal financial assistance under the Federal Water Pollution Control Act. To obtain assistance, a public body must be unable to obtain on reasonable terms sufficient credit to finance its actual needs. Initial capital for the Authority is provided, along with capacity to issue obligations, general powers, tax exemption, and administrative regulations. Pursuant to this Act other federal acts would be amended as necessary. (Smiljanich-Florida)
W71-07222

DETERGENT POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO ESTABLISH STANDARDS AND PROGRAMS TO ABATE AND CONTROL WATER POLLUTION BY SYNTHETIC DETERGENTS).

Senate Bill 75, 92d Cong, 1st Sess (1971). 14 p.

Descriptors: *Detergents, *Pollution abatement, *Phosphates, *Water quality control, Chemical wastes, Domestic wastes, Industrial Wastes, Water pollution sources, Water pollution effects, Federal government, Adoption of Practices, Legislation, Alkylbenzene sulfonates, Eutrophication, Biodegradation, Toxicity, Public health, Sewage treatment, Standards, Regulations, Adjudication procedure, Administrative agencies, Interstate, Industrial production, Legal aspects.

The Detergent Pollution Control Act of 1971 would establish standards and programs to abate and control water pollution by synthetic detergents. Recent studies demonstrate the extent to which polyphosphates in detergents contribute to water pollution due to eutrophication and toxicity caused by their nondegradability. This Act would require the use of non-polluting, safe substitutes for detergent polyphosphates in order to protect lakes and rivers from further pollution from this source. The Administrator of the Environmental Protection Agency would be authorized to establish standards of water eutrophication ability, biodegradability, toxicity, and of effects on the public health and welfare which must be met by all synthetic detergents, according to the procedures prescribed herein. Any detergent which after a future date does not conform with the standards would be prohibited from introduction or delivery into interstate commerce. Criminal penalties are provided, along with procedures for the enforcement of the standards. Appropriations would be made for research and development of pollution-free detergents. (Smiljanich-Florida)
W71-07223

A BILL TO ASSIST THE STATES IN ESTABLISHING COASTAL ZONE MANAGEMENT PLANS AND PROGRAMS.
Senate Bill 638, 92d Cong, 1st Sess (1971). 19 p.

Descriptors: *Coasts, *Water resources development, *Water quality control, *Cost sharing, Federal government, State governments, Legislation, Oceans, Continental Shelf, Estuaries, Estuarine environment, Aquatic environment, Pollution abatement, Water management (Applied), Administration, Planning, Project purposes, Administrative agencies, State jurisdiction, Federal project policy, Financing, Industrial production, Inter-agency cooperation, Geographical regions, Legal aspects.

The coastal states need encouragement and assistance in exercising effectively their responsibilities over the coastal zone through the preparation and implementation of management plans and programs to achieve wise use of the coastal zone through a balance between development and protection of marine resources. To assist the states in establishing coastal zone management plans and programs, this amendment to a prior Act (16 USC 1121 et seq) would authorize grants for a portion of the cost. The Secretary of Commerce would be authorized to make annual grants to any coastal state for the purpose of assisting in the development and administering of such programs. The grants would not exceed one half of the cost to any state. The Secretary would examine the plans prior to granting approval, and would promulgate rules and regulations necessary for the provisions of the Act. A coastal zone management advisory committee would advise the Secretary on matters of policy concerning the coastal zones. Provisions are included for inter-agency cooperation, annual reports, and appropriations. (Smiljanich-Florida)
W71-07224

FUNCTIONS OF CORPS OF ENGINEERS IN ISSUING PERMITS FOR WORK IN NAVIGABLE WATERS.
33 Code of Federal Regulations, Sec 209.120 (1970). 8 p.

Descriptors: *Administrative agencies, *Administration, *Navigable waters, *Construction, Permits, Regulation, Navigation, Fish, Wildlife, Conservation, Water pollution, Ecology, Federal government, Navigable rivers, Harbors, Piers, Dams, Dikes, State governments, Flood control, Prospects, Recreation, Water policy, Legal aspects, Channels.

Outlining the administrative procedure under which the Corps of Engineers operates, this federal regulation describes the Corps' functions, jurisdiction, and policies in granting permits for work in navigable waters. The Corps supervises river, harbor, and flood control improvements authorized by law and administers certain laws for the protection and preservation of navigation and navigable waters in the United States. The regulation lists the principal laws concerning navigation and navigable waters over which the Corps has jurisdiction. Most of these laws relate to various types of construction on waterways and improvements in navigable rivers. The Chief of Engineers of the Corps has been authorized to delegate authority to district engineers to issue permits for work done in or over navigable waters. Procedures for obtaining permits are outlined. The general policy for issuing permits rests on an evaluation of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, pollution, aesthetics, ecology, and the general public interest. Other provisions describe the relation between the Corps and other authorities in issuing permits and issuance of permits where proposed improvements may effect flood control projects, coastal waters, the flow of water, water quality, or other aspects of navigation. (Duss-Florida)
W71-07225

ERS, DREDGING, ETC, IN WATERWAYS.
Code of Federal Regulations, Sec 209.130 970) 11 p.

escriptors: *Dredging, *Piers, *Administrative cisions, *Permits, Channel improvement, En- neering structures, Docks, Abutments, Federal vernment, Administration, Legal aspects, Ad- inistrative agencies, Regulation, Water resources, ater policy, Engineering, Navigation, Navigable aters

pplication for a permit to construct piers or edge in waterways consists of a letter requesting e permit accompanied by maps and plans of the oposed work. This letter is submitted to the Dis- ct Engineer in charge of the concerned locality. hile there is no prescribed form, the letter must ntain the following: (1) address of applicant, (2) te, (3) name of the waterway, (4) location of ork, (5) description of work, and (6) a statement to whether the work is within the corporate nits of a municipality. Responsibilities of the Dis- ct Engineer are specified in this regulation. The eparation of maps and plans is also explained. he contents of permits are discussed, pointing out e responsibilities of the parties. Specification for ectrical transmission lines are detailed. Generally pplicants have three years to complete work, but tensions may be granted. If future operations by e United States require an alteration in the posi- on of the structures or work or if, in the opinion of e Secretary of the Army, it would cause un- asonable obstructions to navigation, the owner ll be required to remove the obstruction without pense to the United States. (Robinson-Florida) 71-07226

HAT'S AHEAD FOR OUR PUBLIC LANDS,
amilton K. Pyles.
ashington, Natural Resources Council of Amer- a, 1970. 342 p.

escriptors: *Administrative agencies, *Public nds, *Resource development, *Federal reserva- ns, Water resources, Water resources develop- ent, Conservation, Fish conservation, Wildlife, ildlife conservation, Water policy, Area development, Federal government, Natural sources, Multiple-purpose projects, Water pply, Lumber, Recreation, Land use, Forests, nd development, Land resources, Non-structural ternatives.
entifiers: *Public Land Law Review Commission.

he Natural Resources Council of America has un- rtaken to review and analyze the work of the blic Land Law Review Commission. The Com- ission was directed to determine the best uses of me 700 million acres of public lands and to make commendations concerning the laws governing ese public lands. The review is conducted in ree parts. Part one, entitled 'Reviews of One- hird of the Nation's Land', includes: (1) a review the commission's final report; (2) environment d water resources; (3) fish and wildlife relations;) the Outer Continental Shelf; (5) administrative d legislative jurisdiction; and (6) disposal and re- ntion of public lands. Part two, entitled 'Indepen- nt Reviews of Reports' includes: (1) regional and cal land use planning; (2) public land timber pol- y; (3) water resources; (4) fish and wildlife sources; (5) outdoor recreation uses; and (6) venue sharing in lieu of taxes. Part three includes ports on the eleven meetings held by the Com- ission, the Advisory Council, and Governors' presentatives. The reports are not verbatim, but e accounts attempting to capture the sense of scussion and provide a useful background for un- rstanding consideration of problems and recom- ended solutions. (See also W71-07228 thru W71- 7236) (Hart-Florida) 71-07227

OMMENTS ON THE MAKEUP AND IRECTION OF THE PUBLIC LAND LAW REVIEW COMMISSION'S FINAL REPORT AND RECOMMENDATIONS,
Hamilton K. Pyles.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 4-12 1970. 37 ref.

Descriptors: *Public lands, *Federal reservations, *Administrative agencies, *Resource development, Conservation, Land use, Land development, Land resources, Non-structural alternatives, Economics, Land management, Land, Federal government, State governments, Local governments, Planning, Future planning (Projected), Project planning, Legislation.

The Public Land Law Review Commission's report is organized to accommodate the finding of the study program; accordingly, in the author's opinion it is rather disjointed. Chapters One and Two describe 'where and what are public lands' and to whom they are important. Plenary recommendations on coordinating public land use with environmental problems are covered in Chapters Three and Four. Major individual commodities and services in the use of public lands are contained in Chapters 5-13. Chapters 14-19 deal with such special problems as 'land grants to the states' and 'federal legislative jurisdiction'. Recommendations on organization, administration, and budgeting are in Chapter 20. Despite disavowals, economic considerations appear to dominate the rationale for many recommendations. It is suggested that Congress should become more involved in establishing guidelines for land use and disposal. Also, the report urges state and local governments to become more involved with disposition of public lands within their borders. Additionally, the report advocates greater public participation in public land-use planning and in developing an understanding of the nature and extent of permitted uses. (See also W71-07227) (Hart-Florida)
W71-07228

THE ENVIRONMENT AND WATER RESOURCES,
Harold G. Wilm.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 47-57, 1970.

Descriptors: *Water resources, *Land resources, *Environment, *Federal reservations, Area redevelopment, Water resources development, Public lands, Administrative agencies, Non-structural alternatives, Land management, Federal government, State governments, Planning, Future planning (Projected), Project planning, Legislation, Lumber, Forests, Land development.

Under the dominant land use concept, if a tract of public land is classified for timber production, the land manager may be tempted to manage entirely for wood production. However, the dominant use concept should be broadened to include the greatest net public benefit theory, maximizing all resource values. Comprehensive land-use planning should be effected, focusing on administrative policies and intergovernmental procedures to include cost-sharing guidelines and proposing alternative actions for contingencies. However, financial assistance furnished the states is inadequate to enable them to exert full responsibility for water and land resource planning. Also, although the statutory goals are laudatory, they are too general for use by land managers; the goals must be much more explicit and descriptive. It is suggested that government should sell water arising from and leaving public lands at prices equal to the net cost of watershed and forest management prices. Although the Public Land Law Review Commission recommended merger of the Forest Service and the Department of the Interior into a new Department of Natural Resources, the recommendation was opposed because of administrative complications. (See also W71-07227) (Hart-Florida)
W71-07229

FISH AND WILDLIFE AS RELATED TO OTHER RESOURCES AND VALUES,
Phillip W. Schneider.
In: What's Ahead for Public Lands, Natural Resources Council of America, p 58-74, 1970.

Descriptors: *Fish, *Wildlife, *Water resources, *Land resources, Lumber, Lumbering, Environment, Federal Reservations, Area redevelopment, Water resources development, Public lands, Administrative agencies, Non-structural alternatives, Land management, Federal government, State governments, Planning, Future planning (Projected), Project planning, Legislation, Forests, Land development.

The author of this article finds two recommendations of the Public Land Law Review Commission to be highly objectionable: (1) replacement of the multiple-use doctrine with a dominant use concept; and (2) a strong emphasis on statutory direction of non-commodity values and their management. The primary objective of the public land custodian should be to manage federal public lands to prevent damaged environmental quality and enhance the quality of the environment where feasible. Domestic livestock grazing is the largest past and present use; timber production on federal land represents one-third of the nation's output; there are 8245 producing mineral leases on federal lands; and commercial and recreational occupancy are important uses. Public land policy, while assuring environmental quality, must also encourage economic growth. Furthermore, clear statutory authority should be given to federal officials for final land use decisions that affect fish and wildlife habitats or populations on public lands. A federal-state fish and resident wildlife coordinating committee should be established in each state. Upon disposal of federal public lands, rights should be retained to protect fish and wildlife. (See also W71-07227) (Hart-Florida)
W71-07230

THE OUTER CONTINENTAL SHELF,
Frank J. Barry.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 75-84, 1970. 10 p, 19 ref.

Descriptors: *Administrative agencies, *Submerged Lands Act, *Oil, *Regulation, Administrative agencies, Leases, Exploitation, Federal jurisdiction, Federal government, State jurisdiction, Oil fields, Legislation, Oil industry, Beds, Beds under water, Continental Shelf.
Identifiers: *Outer Continental Shelf Lands Act.

The resources, Legislation, Regulations, and Commission's recommendations concerning the Outer Continental Shelf are considered in this article. The Continental Shelf is defined, and exploitation of mineral resources, both present and future, discussed. Two acts, the Submerged Lands Act and the Outer Continental Shelf Lands Act, directly affect exploitation of the shelf, and they are briefly considered. Regulations promulgated by the Secretary of the Interior under the Acts are commented upon. Although the federal legislation was intended to pre-empt state intervention in the Outer Continental Shelf, several states attempt to regulate oil production. Deficiencies listed in administration of the Outer Continental Shelf are: (1) failure of federal authorities to exercise exclusive jurisdiction and to permit production at the maximum efficient rate; (2) failure to prescribe and enforce strict regulations for environmental protection; (3) failure to conduct pre-leasing investigations to obtain maximum remuneration; and (4) failure to permit leasing by small independent operators. Also, the many recommendations of the Public Land Law Review Commission are discussed and criticized in detail. (See also W71-07227) (Hart-Florida)
W71-07231

POLICY, PLANNING, AND ADMINISTRATION,
Lynton K. Caldwell.

In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 116-1281970. 13 p, 4 ref.

Descriptors: *Planning, *Administration, *Administrative agencies, *Federal project policy, Projects, Project planning, Project purposes, Future planning (Projected), Decision making, Programs, Non-structural alternatives, Adoption of practices, Coordination.

Those portions of the report of the Public Land Law Review Commission concerned with overall policy, planning, and administration are examined in this review. It is not concerned with specific resource use nor with primarily technical aspects of law or fiscal policy. The author first examines the context of the report and its general character and orientation, then considers three groups of recommendations pertaining to policy, planning, and administration, and concludes with observations on how the commission's report may best be used. Major topics are entitled: (1) characterizing the report; (12) underlying premises and assumptions; (3) some specific recommendations, which include land use planning, land policy and the environment, and administrative organization; and (4) implementing the recommendations. (See also W71-07227) (Hart-Florida)
W71-07232

THE DEVELOPMENT, MANAGEMENT, AND USE OF WATER RESOURCES ON THE PUBLIC LANDS,
Edward Weinberg.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 181-189, 1970.

Descriptors: *Water resources development, *Water management (Applied), *Public land, *Water utilization, Reservation doctrine, Administrative agencies, Legal aspects, Judicial decisions, Water allocation (Policy), Eminent domain, Condemnation, Preferences (Water rights), Federal government, Non-structural alternatives, Water policy, Water requirements, State governments.

In this review of the Public Land Law Review Commission's 'Study of the Development, Management, and Use of Water Resources on the Public Lands' two legal issues are considered: (1) does the present legal system provide for federal rights adequate for present and future uses on the public lands; and (2) do federal water rights under the present legal system interfere with or obstruct beneficial use of available water for beneficial non-federal public and private purposes. The author believes the study unduly magnifies uncertainties posed by the reservation doctrine and its potential for obstructing beneficial use, citing three reasons for his view: (1) the quantity of water required by federal agencies is negligible in comparison with the total western state requirements; (2) only one instance is shown where the reservation doctrine permitted taking a water right vested under state law without compensation; and (3) conclusions are based upon inferences rather than judicial decisions. Implications of the reservation doctrine upon conservation interests are also considered. The author believes that the fundamental question presented is whether the reservation doctrine is meritorious and serves a useful purpose. (See also W71-07227) (Hart-Florida)
W71-07233

REVIEW OF THE REPORT ON FISH AND WILDLIFE RESOURCES ON PUBLIC LANDS,
Lloyd W. Swift.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 190-201, 1970.

Descriptors: *Administrative agencies, *Public lands, *Fish, *Wildlife, Permits, Federal government, State governments, Federal reservations, National parks, Recreation, Fish management, Fish conservation, Wildlife conservation, Highway effects, Hunting, Wildlife management, Animal control, Balance of nature, Wildlife habitats, Habitat improvement, Legislation, Financing, Government finance.

In reviewing the report by the Public Land Law Review Commission on fish and wildlife resources on public lands, this article considers: (1) objectives of the study; (2) methods used; (3) accuracy; (4) inclusiveness; (5) accuracy of analysis; (6) problem and policy issue identification; and (7) alternatives. Some propositions discussed in the section dealing with alternatives are: (1) harvest fish and game on federal lands; (2) federal-state cooperation in fish and wildlife management; (3) responsibility for habitat management on federal lands; (4) return of ceded fish and wildlife jurisdiction to the states; (5) use of water for fish and wildlife management on federal lands; (6) highway planning in relation to fish and wildlife management; (7) recreational use of wildlife refuges; (8) public hunting to control game animals in national parks; (9) simplifying statutes pertaining to fish hatcheries and wildlife refuges; (10) single jurisdiction over federal land areas; (11) retention of important fish and wildlife values in disposal of public lands; (12) increasing the disposals of land for fish and wildlife management through the Recreation and Public Purposes Act; (13) increasing federal funds for fish and wildlife programs on federal lands; and (14) requirements for state hunting and fishing licenses on federal lands. (See also W71-07227) (Hart-Florida)
W71-07234

A REPORT ON THE PUBLIC LAND LAW REVIEW COMMISSION MEETING, FEBRUARY 21, 1969, WASHINGTON, DC,
Hamilton K. Pyles.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 244-251, 1970.

Descriptors: *Continental shelf, *Administrative agencies, *Beds under water, *Public lands, Judicial decisions, Legal aspects, Administration, Administrative decisions, Beds, Oil, Oil industry, Oil fields, Regulations, Federal project policy, State governments, Federal jurisdiction, Leases, Boundary disputes, Environment, Conservation, Natural resources, Legislation, Project planning, Water policy.

The topics discussed at this meeting of the Public Land Law Review Commission were Outer Continental Shelf lands and administrative procedures on public lands. The report on the Outer Continental Shelf attempts to capture the sense of the various viewpoints regarding major policy issues or possible alternatives to the existing systems of law, regulation, and policies. Six questions were considered at the meeting on the Continental Shelf; the positions represented on the questions were: (1) oil, gas, and mining interests wished to continue the present regulation system of exploitation, with no requirement to divulge 'trade secrets' and without leasing of hard minerals; (2) states adjacent to the Shelf desired a firm boundary and larger role in development of policy, regulations, and practices, and a share of revenues; and (3) more general interests desired increased emphasis upon the Shelf's environment and coordinated resource management. The section on administrative procedures was primarily concerned with administrative law relating to public lands. (See also W71-07227) (Hart-Florida)
W71-07235

A REPORT ON THE PUBLIC LAND LAW REVIEW COMMISSION MEETING, APRIL 17-18, 1969, WASHINGTON, DC,
Hamilton K. Pyles.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 252-259, 1970.

Descriptors: *Public lands, *Fish, *Wildlife, *Water resources, Administrative agencies, Administrative decisions, Administration, Reservation doctrine, Conservation, Fish conservation, Federal reservations, Land tenure, Fish management, Wildlife conservation, Wildlife habitats, Wildlife management, Recreation, Hunting, Fishing, Natural resources, Legal aspects.

This article reviews the Public Land Law Review Commission meeting considering: (1) fish and wildlife resources on the public lands and (2) the development, management, and use of water resources on the public lands. Five questions concerning each of these two topics were discussed at the meeting. For example, two questions on fish and wildlife resources were: (1) should the fact that public lands are valuable for fish and wildlife support and use constitute the determinant, standing alone, as to whether such public lands should be disposed of or retained in federal ownership; and (2) what should be the role of federal lands and resources in supporting, protecting, and enhancing various fish and resident species, and in providing for their use and enjoyment by individuals. The responses given to the questions are analyzed and commented upon. The questions presented in the water resources section are similarly considered and discussed. An example of the water resource questions is: does the present legal system provide for federal water rights adequate for present and future uses on the public lands. (See also W71-07227) (Hart-Florida)
W71-07236

WATERS V PUTNAM (REVIEW OF ADMINISTRATIVE DECISION AS TO REPRESENTATION ON WATERSHED DISTRICT BOARD).
183 NW 2d 545-551 (Minn 1971).

Descriptors: *Minnesota, *Watershed management, *Water districts, *Administrative decision, Administrative agencies, Adjudication procedure, Water allocation (Policy), Decision making, Legislation, Flood control, Surface runoff, Water zoning, Water resources development, Local governments, State governments, Cities, Surface waters, Water conservation, Water management (Applied), Judicial decisions, Legal aspects.

Plaintiff landowners sought writs of certiorari and mandamus in obtaining review of defendant Water Resources Board's refusal to reopen proceedings establishing a watershed district. Plaintiff contended that appeal by certiorari was necessary, as there was no regular appeal procedure from the Water Resources Board's decision, and that the Board should be forced to reapportion the board of managers of a multi-county watershed district according to the water conservation needs of the area. Defendant contended that plaintiffs had normal appellate procedures open to them and that the Water Resources Board, in exercising its discretion, had no obligation to insure equal representation on the board of managers. In affirming the quashing of the writs by the lower court, the Supreme Court of Minnesota noted that plaintiffs had normal appellate procedures for judicial review which it failed to utilize in timely fashion. In exercising its discretion, the Water Resources Board had no constitutional obligation to insure equal county representation on the board. (Sedlacek-Florida)
W71-07237

BROOKS V VOLPE (CONSTRUCTION OF HIGHWAY NEAR RECREATION AREA).
319 F Supp 90-92 (WD Wash 1970).

Descriptors: *Highways, *Highway effects, *Recreation facilities, *Camp sites, Federal government, Environmental effects, Parks, Recreation, Wildlife, Wildlife conservation, Waterfowl, Legislation, Streams, Ecology, Environment, Legal aspects, Judicial decisions.
Identifiers: *National Environmental Policy Act, *Federal-Aid Highway Act.

Plaintiffs sought a preliminary injunction to enjoin defendants, representing the Department of Transportation, from constructing part of an interstate highway on the northern border of a campgro

l recreational area. Plaintiffs alleged non-com-
ance with portions of the Federal-Aid Highway
t of 1968 and the National Environmental Policy
t of 1969. Plaintiffs contended that the former
restricted and conditioned the use of public
rks, recreational areas and wildlife-waterfowl
uges and that the latter act required a detailed
ject statement by the defendants, which they
l failed to prepare. The federal district court de-
d the injunction. The proposed highway north of
campground areas was not a use contemplated
the Federal-Aid Highway Act. The National En-
onmental Policy Act was prospective and not
rospective legislation, and the administrative
ision concerning location of the highway was
de prior to passage of the act. Therefore a
ailed statement was not required. (Duss-
rida)
71-07304

ATERSHED LOANS.
rdue Univ., Lafayette, Ind. Water Resources
search Center.

ailable from the National Technical Information
vice as PB-198 647, $3.00 in paper copy, $0.95
nicrofiche. 7 Code of Federal Regulations, Secs
23.141 thru 1823.161 (1970). 15 p.

scriptors: *Administrative agencies,
/atershed Protect. and Flood Prev. Act,
/atersheds (Basins), *Loans, Regulations,
gislation, Watershed management, Local
vernments, Financing, Interest, Capital, Water
pply, Water rights, Dams, Drainage, Irrigation,
gal aspects.

ting forth general policies and authorizations,
se administrative regulations provide for
tershed loans and advances, under the
atershed Protection and Flood Prevention Act,
local organizations. Technical and financial
istance may be given to such organizations for
nning and carrying out works of improvement
l for protecting and developing the land and
ter resources in small watershed or sub-
tershed project areas, including recreation, wil-
fe, and storage of water for future use. The local
pulace acting through local organizations must
tiate and assume full responsibility for small
tershed projects. Applications are made through
county Farmers Home Administration (FHA)
ice. Other topics covered by the section include:
eligibility for loans and advancements; (2) pur-
ses and limitations for loans and advancements;
special requirements for loans and advances;
terms and interest rates; (5) security; (6) ap-
oval; (7) multiple-loan disbursements; (8) clos-
of loans and advances; (9) accountability for
n proceeds; (10) accounts and records; (11)
n approval; (12) loan closing; (13) processing
vances; and (14) actions subsequent to closing.
art-Florida)
71-07305

BLIC HEARINGS UNDER THE FEDERAL ATER POLLUTION CONTROL ACT.
Code of Federal Regulations, Part 606 (1970).

scriptors: *Administrative agencies, *Adjudica-
n procedure, *Water pollution control, *Regula-
n, Water quality, Water quality control, Water
llution, Pollution abatement, Administrative
cisions, Legislation, Administration, Federal
vernment.
ntifiers: *Water Pollution Control Act.

e procedures for public hearings under the
deral Water Pollution Control Act are
ablished in this regulation. The following areas
covered: (1) definitions, (2) initiation of
oceeding and appointment of the hearing board,
organization and general procedures of the
ard, (4) notice of hearing, (5) service of notice
hearing, (6) publication of notice, (7) parties,
presentation of evidence by the commissioner,
(9) hearing procedure, (10) record of proceedings, (11) oral argument, and (12) final findings and recommendations. The hearing board is composed of five persons appointed by the Secretary of the Interior. The hearing is generally informal; however, the board may rule upon admissibility of evidence, examine witnesses, and regulate the course of the hearing. A verbatim record of the hearing is required. Witnesses are sworn, and each party may present evidence and cross-examine witnesses. Oral arguments are permitted in the discretion of the board. (Hart-Florida)
W71-07308

ENVIRONMENTAL POLICY: NEW DIRECTIONS IN FEDERAL ACTION, RESTRUCTURING FOR COORDINATIVE POLICY AND ACTION,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 04A.
W71-07310

ENVIRONMENTAL MANAGEMENT: WATER AND RELATED LAND,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07311

ENVIRONMENTAL POLICY AND THE CONGRESS,
Senate, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07312

FEDERAL POLICY PLANNING FOR THE MARINE ENVIRONMENT,
National Council on Marine Resources and Engineering Development, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07313

ENVIRONMENTAL MANAGEMENT AND THE DEPARTMENT OF THE INTERIOR,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07314

PROVIDING ENVIRONMENTAL SCIENCE SERVICES,
Department of Commerce, Washington, D.C.
Walter A. Hahn.
Public Administration Review, Vol 28, No 4, p 326-341, July-Aug 1968.

Descriptors: *Environment, Federal government, Management, Planning, Coordination.
Identifiers: *Environmental Science Services Administration, Department of Commerce, Environmental policy analysis.

It is the purpose of this article to describe the origins and subsequent developments of the Environmental Science Services Administration (ESSA) as an experiment in public administration. It briefly traces what has come of the 'ESSA idea' from its conceptual origins to its current manifestation. Some of the services performed by ESSA are: Hazard warning, aid to business and government, consumer benefits, aid to other federal agencies, and assistance in maintaining environmental quality. The ESSA, formed in 1965, combines the environmental science and service capabilities and activities of the Weather Bureau, the Coast and Geodetic Survey, and the Central Radio Propagation Laboratory. Today there exists under one organizational roof the Department of Commerce's activities in seismology, oceanography, hydrology, meteorology, geophysics, hydrography, aeronomy, geodesy, geomagnetism and telecommunications. The ESSA idea also encompasses a concept labelled 'the multiple use of technology'--using modern technology to solve environmental problems. Another concept of equal importance is a broad program of both long-range, mission-oriented research and development. The essence of ESSA's entire output is information: Warnings, forecasts, charts and reports, consulting and research, science and technology. ESSA has provided leadership in a number of international environmental activities. In order to work effectively in the future, environmental policy analysis is urgently needed. (Wray-Chicago)
W71-07315

THE SAN FRANCISCO BAY PLAN: COMBINING POLICY WITH POLICE POWER,
E. Jack Schoop, and John E. Hirten.
Journal of the American Institute of Planners, p 2-10, Jan 1971.

Descriptors: *Water policy, Decision making, Management, Methodology, Dredging.
Identifiers: *San Francisco Bay Plan, *San Francisco Planning and Urban Renewal Association, *Police power, Fill control power, Comprehensive plan.

In 1969, the San Francisco Bay plan received an AIP Award of Merit in recognition of its methodology and relevancy. It also won sufficient political support to secure the establishment of a permanent commission to carry out the plan. Extensive participation of the public and decision makers was employed to develop needed support. Capitalizing on its interim power to control filling and dredging while the plan was being prepared, the San Francisco Bay Conservation and Development Commission openly developed its plan as a series of policy decisions establishing a legal and technical frame of reference for use of the fill control power. Policy issues in the plan are clear-cut and relevant, and a tight management system was used to orchestrate the participation of many consultants and a large number of decision makers and interest groups. The process is being continued in modified form as the commission begins implementation of the plan. (Wray-Chicago)
W71-07316

A NEW KIND OF INSTITUTION,
New England River Basins Commission, Boston, Mass.
Frank Gregg.
Water Spectrum, Army Corps of Engineers, Spring 1971, p 26-32.

Descriptors: *Water Resources Planning Act, Coordination, Management, *Regional analysis.
Identifiers: *New England River Basin, Southeastern New England, State focus, Federal-State cooperation, Joint planning.

The New England River Basins Commission has considered since its founding in 1967 how it can best contribute to sound management of the region's water and related land resources. A major output of the commission is expected to be reports which recommend Federal, State, local and private actions to meet public needs for conservation and use of waters and related lands. The Commission's strategy for completing the comprehensive joint plan includes: (a) a New England Framework to provide information, (b) water and land management plans for each state, (c) water and land management plans for selected sub-regions. A principle weakness of coordinated planning to date is that the planning process is not seen by all participants (Federal and State) as a vehicle that each can use for planning its own action programs. The Commission aims to develop a planning approach by which Federal and State agencies develop positive plans for major uses--from preservation of ecological systems to intensive development projects. To achieve joint planning, the Commission will assemble a professional staff team for each formally organized study. They will formulate broad policy guidelines. Federal agencies, working with their State counterparts, will be responsible for planning for specific uses and functions: flood control, water supply and quality control, outdoor

recreation, fish and wildlife, etc. Appropriations for participation by Federal agencies and Commission staff in joint studies will be requested through coordinated budgets submitted to the Water Resources Council. Cost of organized State participation in joint plans will be born primarily by the States, assisted by Federal planning grants. (Wray-Chicago)
W71-07320

MALTA CONFERENCE - PACEM IN MARIBUS.

Lawyer of the Americas, Vol 2, No 3, p 481-497, Oct 1970.

Descriptors: *Conferences, *Oceans, *Resources, *Ecology, *Water pollution, *Legal aspects, Oil wastes, Exploration, Fisheries, Law of the Sea.
Identifiers: *Malta Conference 1970, Atlantic - Pacific Canal.

Some sixty countries participated in the 1970 Malta Conference which was sponsored by the Center for the study of Democratic Institutions in Santa Barbara, California. Their intent was to generate support for the establishment of a continuing body in Malta to guide the United Nations and others regarding decisions about the ocean. Political and legal problems, the extraction of living and non-living resources, and science policy and ecology were discussed. Fisheries problems, non-living resource exploitation policy and jurisdiction, U.S. - U.S.S.R. Draft Treaty on Prohibiting the Emplacement of Nuclear Weapons on the Seabed and Ocean Floor, limits of National Jurisdiction, and President Nixon's proposal for a seabed regime were included. The need for conservation, rational use of ocean resources and pollution were considered in conjunction with the above subjects. (Ensign-PAI)
W71-07330

CALIFORNIA ENVIRONMENTAL LAW - A GUIDE.
Center for California Public Affairs, Claremont.

Center for California Public Affairs, Claremont, Cal, 1971. 171 p, 79 ref.

Descriptors: *California, *Legislation, *Environment, *Air pollution, *Water quality, *Land use, *Solid wastes, *Pesticides, *Radiation, Laws, Statutes.

The major state laws regulating environmental quality in California including amendments and new laws enacted by the 1970 legislature are summarized. The scope, major provisions and arrangement of selected statutes are outlined. The core of California law concerning air quality, land use, solid waste management, noise control, pesticides and radiation are described. Selected bills which were not passed are summarized as there is a good possibility that they will be re-introduced in the 1971 legislature. (Ensign-PAI)
W71-07331

STANDARDS-SETTING CONFERENCES, HEARINGS, AND NOTIFICATION OF ALLEGED VIOLATORS OF WATER QUALITY STANDARDS.
18 Code of Federal Regulations, part 604 (1970). 5 p.

Descriptors: *Administrative agencies, *Adjudication procedure, *Water quality, *Regulation, Water quality control, Water pollution, Water pollution sources, Water pollution control, Pollution abatement, Administration, Legislation, Federal government.

Procedures for revision of water quality standards and for public hearings on water quality are established in this regulation. Definitions of various terms, such as 'Act', 'commissioner', and 'water quality standards', are first provided. Then, provisions are set forth for: (1) INITIATION OF WATER CONFERENCES, (2) organization and general procedures of conferences, (3) notice of conferences, (3) notice of conferences, (4) service of notice, (5) publication of notice, (6) parties, (7) presentation of material by the Federal Water Pollution Control Administration, (8) conference procedure, (9) record of proceedings, and (10) promulgation of water quality standards. Provisions concerning water quality public hearings relate to: (1) initiation of proceedings and appointment of the hearing board, (2) organization and general provisions of the hearing board, (3) notice of hearing, (4) service of notice, (5) publication of notice, (6) parties, (7) presentation of material by the commissioner, (8) records of procedure, (9) oral arguments, and (10) final findings and recommendations. In addition, provisions are promulgated for notification of alleged violators of water quality standards by the Secretary. (Hart-Florida)
W71-07354

SECOND SESSION OF THE CONFERENCE ON THE MATTER OF POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07361

FILING OF REPORTS WITH SECRETARY OF THE INTERIOR BY PERSONS WHOSE ALLEGED ACTIVITIES RESULT IN DISCHARGES CAUSING OR CONTRIBUTING TO WATER POLLUTION,

18 Code of Federal Regulations, part 607 (1970). 3 p.

Descriptors: *Administrative agencies, *Water pollution control, *Regulation, *Water pollution sources, Water pollution, Legislation, Federal government, Water quality, Water quality control, Pollution abatement, Pollutants, Thermal pollution, Pollutant identification, Water pollution treatment, Administration.

At the request of a majority of conferees at any conference, or in connection with a hearing under the Federal Water Pollution Control Act, the Secretary of the Interior may require any person whose alleged activities result in discharges causing or contributing to water pollution of waters which are the subject of the conference or hearing to report the character, kind, and quantity of discharges, and methods used to prevent pollution. The request for the written report may be served by mailing. No particular form for the report is required unless specified by the Secretary. The report, based on existing data, must identify the causes, sources, and physical, chemical, and biological properties of the pollutional discharge. Also, the thermal characteristics and the 24 hour daily quantity of the discharge must be reported. Facilities used to prevent or reduce the discharges are to be described. The report shall be filed in five copies within the time specified by the Secretary. Trade secrets are not required to be disclosed, and all data shall be considered confidential. The penalty for failure to comply is forfeiture of $100 for each day of default. (Hart-Florida)
W71-07421

HALLS LEVEE DISTRICT V HAUBER (ILLEGAL CONSTRUCTION OF DAM ACROSS LEVEE DISTRICT'S DITCH).
461 SW2d 16-24 (Ct App Mo 1970).

Descriptors: *Missouri, *Drainage districts, *Dams, *Ditches, Flood control, Easements, Right-of-way, Drainage, Levees, Lakes, Remedies, Land reclamation, Public rights, Relative rights, Water levels, Benefits, Outlets, Judicial decisions, Legal aspects, Missouri River.

Defendants appealed from a judgment granting plaintiff, a county levee district, a mandatory injunction requiring defendants to remove a rock dam. Defendants had erected the dam across a drainage ditch maintained by the plaintiff. Defendants had originally removed a dam built by the district and subsequently sought permission from it to rebuild the dam. Permission was denied, but defendants nevertheless built the dam. Defendants contended the trial court erred because: (1) plaintiff had an adequate remedy at law by filing another reclamation plan, (2) removal of the dam would be contrary to plaintiff's present reclamation plan, (3) plaintiff had no drainage rights over defendants' land, and (4) plaintiff's suit enforced private rights and not district rights. The Kansas City Court of Appeals both affirmed and amended the lower court decision for plaintiff. Plaintiff's equity action was proper as its legal remedy would have constituted an unnecessary delay in securing relief. Moreover, removal of the illegal dam would not be contrary to the district's reclamation plan, and the question of the plaintiff's rights of drainage across defendants' land was irrelevant to the case. Finally, plaintiff was legally entitled to maintain the suit notwithstanding the fact that success might result in benefits to the private rights of resident landowners. (Duss-Florida)
W71-07429

DRINKWINE V STATE (REASONABLE USE DOCTRINE AS APPLIED TO PERCOLATING WATERS).
274 A2d 485-487 (Vt 1970). 3 p.

Descriptors: *Vermont, *Percolating water, *Reasonable use, *Relative rights, Competing uses, Water supply, Water shortage, Groundwater, Water conservation, Groundwater mining, Water demand, Water requirements, Land tenure, Water rights, Springs, Subsurface waters, Water wells, Pumps, Withdrawal, Water table, Water rights, Administrative agencies, Judicial decisions, Legal aspects.

Plaintiff landowners sought to enjoin defendant State Fish and Game Department from continuing to operate certain pumps and wells which allegedly pumped unreasonable amounts of water to the detriment of plaintiff's springs. Plaintiff contended that the doctrine of reasonable use should apply to percolating waters due to the present increased scarcity and value of water as a commodity. Defendant contended that the doctrine of reasonable use did not apply to percolating waters and that plaintiff had failed to adequately allege the scarcity of water and the causal connection between defendant's pumping and the depletion of plaintiff's springs. In affirming a lower court order dismissing plaintiff's complaint, the Supreme Court of Vermont noted that the doctrine of reasonable use has no application to the case. Percolating waters are regarded as a part of the land and, as such, no correlative rights in the waters exist between adjacent landowners. The allegations of fact were insufficient to show a scarcity of waters in Vermont or a causal connection between defendant's actions and plaintiff's injury. (Smiljanich-Florida)
W71-07430

GRANT V KATSON (INJUNCTION TO PREVENT UPHILL LANDOWNER FROM FURTHER DIVERSION AND INCREASE IN SURFACE WATER RUNOFF).
274 A2d 88-90 (Md App 1971). 3 p.

Descriptors: *Maryland, *Surface runoff, *Diversion, *Remedies, Drainage effects, Alteration of flow, Land tenure, Competing uses, Damages, Erosion, Baffles, Concrete structures, Diffusion, Runoff, Repulsion (Legal aspects), Riddance (Legal aspects), Artificial use, Judicial decisions, Legal aspects.

Plaintiff landowner brought action for continuing trespass and an injunction. Defendant, an uphill landowner on a natural watershed, increased an

erted the flow of surface water over his land to the plaintiff's downhill land by constructing a ne patio with improper drainage and a water ffle. Plaintiff contended that an injunction was e proper remedy. Defendant contended that an ard of money to the plaintiff for construction of new drainage system on his property would be fficient to prevent future damage by diverting the jectionable surface flow. In partially reversing a wer court judgment, the Court of Appeals of aryland held that, although a judgment for mages was correct, an award of money to build a w drainage system was erroneous. A downhill downer is entitled to an injunction requiring hill landowners to prevent the further artificial crease and diversion of surface waters onto the wnhill land. The award to build a new drainage stem was unnecessary, as defendant should bear e burden of correcting the situation. (Smiljanich-orida)
71-07431

ONSOULIN V SHELL OIL CO (ESTOPPEL BY ONTRACT AS APPLICABLE TO MINERAL ASES).
l Fed Supp 900-902 (WD La 1971).

escriptors: *Louisiana, *Leases, *Contracts, oyalties, Bayous, Beds under water, Water hts, Land tenure, Water allocation (Policy), ater distribution (Applied), Water contracts, creage, Land resources, Ownership of beds, nds, Exploitation, Payment, Mineralogy, Oil, Oil dustry, Gases, Gulf Coastal Plain, State governents, State jurisdiction, Judicial decisions, Legal pects.

aintiff landowner brought action to cancel a lease der which defendant oil company was granted neral rights in land. Plaintiff contended that dendant wrongfully allocated water bottom acreage the state and that plaintiff should therefore cover royalties paid to the state. Defendant conded that plaintiff had acceded to the original vision order allocating royalties to the state thout disputing the apportionment of acreage d was therefore estopped to assert that royalties om the water bottoms were wrongfully paid to the ate. In granting defendant's motion for summary dgment, the United States District Court for the estern District of Louisiana noted that on two occasions plaintiff had signed agreements allocating e water bottom acreage to the state. Defendant lied on these agreements and paid royalties acrding to their strict terms. The principle of estopl by contract is applicable to disputes over oil d gas leases and to inaccurate apportionment in vision orders. Plaintiff's proper remedy was an tion against the state for unjust enrichment. miljanich-Florida)
71-07432

UBLIC WORKS FOR WATER, POLLUTION ONTROL, AND POWER DEVELOPMENT ND ATOMIC ENERGY COMMISSION APROPRIATION ACT, 1971.
ublic Laws No 91-439, 84 Stat 890, 11 US Code ong and Admin News, p 4100-4112 (1970). 13 p.

escriptors: *Government finance, *Water sources development, *Administrative agencies, Financing, Federal government, Legeslation, Administration, Grants, Projects, Pollution abatement, Water works, Water quality control, Rivers, arbors, Flood control, Beach erosion, Interstate ommissions, Waste treatment, Water conservaon, Planning, Hydroelectric plants, Hydroelectric ower, River basin commissions, Legal aspects.

ursuant to previous acts of Congress, money is erein appropriated for specific public works relatg to various agencies of government, including ublic works for water, pollution control, and ater quality administration. The Army Corps of ngineers is authorized to conduct specific civil nctions pertaining to rivers and harbors, flood ontrol, beach erosion, and related purposes. The Department of the Interior is appropriated funds necessary to carry out the Federal Water Pollution Control Act for grants to interstate agencies and for construction of waste treatment works. The Department is further appropriated funds necessary for studies of water conservation and development plans and for activities preliminary to the reconstruction or extension of existing projects. Specific projects relating to water resources are provided funds necessary for their continuation. Regional power administrations, independent river basin commissions, and the Water Resources Council also receive designated funds. The various agencies involved are restricted as to the use of appropriations. (Smiljanich-Florida)
W71-07434

EMERGENCY COMMUNITY FACILITIES ACT OF 1970.
Public Law No 91-431, 84 Stat 886, 11 US Code Cong and Admin News p 4095 (1970).

Descriptors: *Local government, *Community development, *Treatment facilities, *Grants, Legislation, Federal government, Urban renewal, City planning, Economics, Public utilities, Pollution abatement, Public health, Public benefits, Water resources, Financing, Economic impact, Unemployment, Employment opportunities, Cities, Social aspects, Legal aspects.

The Housing and Urban Development Act of 1965, Title VII, is herein amended to authorize appropriation of one billion dollars for grants under a specific section of that act. The act is also amended to extend dates in other sections. The changes are made pursuant to a finding by Congress that, because of a shortage of funds, a large number of local governments throughout the nation are unable to finance construction of vital and urgently needed public facilities. There is an immediate need for such facilities in order to provide basic safeguards for the well-being of the people of the United States, to check widespread pollution of irreplaceable water sources, and to provide a method of combatting rising unemployment. (Smiljanich-Florida)
W71-07435

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN--COMPACT.
Public Law No 91-407, 84 Stat 856, 11 US Code Cong and Admin News, p 4060-4065 (1970). 6 p.

Descriptors: *Interstate compacts, *Interstate rivers, *Interstate commissions, *River basin commissions, Water districts, State governments, Federal government, Maryland, West Virginia, Pennsylvania, Virginia, District of Columbia, River basins, Water resources development, Administrative agencies, Pollution abatement, River basin development, Water conservation, Project planning, Standards, Sewage treatment, Industrial wastes, Water quality, Classification, Legal aspects.
Identifiers: *Potomac River Basin.

Pursuant to a compact among the states of Maryland, West Virginia, Pennsylvania and Virginia, and the District of Columbia, Congress herein consents to the creation of the Potomac Valley Conservancy District and the Interstate Commission on the Potomac River Basin. The Commission shall have the power: (1) to collect, analyze and distribute data on pollution and other water problems of the Conservancy District and to sponsor research therein; (2) to cooperate with other agencies in formulating uniform rules and regulations concerning pollution abatement and water resources development; (3) to cooperate with public and non-public agencies in the formulation and coordination of plans and programs relating to pollution abatement and water resources development; (4) to make, revise, and recommend to the signatory parties reasonable minimum standards for the treatment of sewage and industrial wastes in the Conservancy District; and (5) to establish water quality standards satisfactory for various classifications of use. The signatory parties will formulate a classification of interstate waters for this last purpose. Provisions as to subsections of the committee and financing are set forth. Congress withheld consent from the provisions as to water quality standards and water classification. (Smiljanich-Florida)
W71-07440

WATER BANK ACT.

Public Law 91-559, 84 Stat 1468, 15 US Code Cong and Admin News, p 6666-6670 (1970). 5 p.

Descriptors: *Wetlands, *Wildlife habitats, *Flood control, *Water conservation, Watershed management, Contracts, Land tenure, Federal government, Legislation, Farms, Agricultural watersheds, Migratory birds, Waterfowl, Wildlife conservation, Adoption of practices, Land management, Land development, Erosion control, Surface runoff, Soil erosion, Wind erosion, Eminent domain, Legal aspects, Administrative agencies, Financing.
Identifiers: *Water Bank Act.

The Water Bank Act is hereby enacted in order to conserve surface waters, to preserve and improve habitats for migratory waterfowl and other wildlife resources, to reduce runoff, soil and wind erosion, to contribute to flood control, and to effect other purposes. The Secretary of Agriculture is authorized to enter into ten-year agreements with landowners and operators in certain wetland areas. The owner shall agree: (1) to place in the program eligible wetland areas he designates; (2) not to drain, burn, fill, or destroy the areas' wetland character, nor to use such areas for agricultural purposes; (3) to effectuate the wetland conservation and development plan for his land; (4) to forfeit all rights upon transfer of the land and to refund all payments upon violation of the agreement; (5) not to adopt practices defeating the purposes of the agreement; and (6) to follow necessary additional provisions the Secretary may adopt. In return, the Secretary shall: (1) make a fair and reasonable annual payment in consideration of the landowner's obligations, and (2) bear a portion of the cost of the conservation and development plan. Various administrative details are set forth. (Smiljanich-Florida)
W71-07444

SUSQUEHANNA RIVER BASIN COMPACT.

Public Law No 91-575, 84 Stat 1509, 15 US Code Cong and Admin News, p 6710-6748 (1970). 36 p.

Descriptors: *River basin commissions, *Interstate compacts, *Federal government, *River basin development, Interstate rivers, Water resources development, United States, Maryland, New York, Pennsylvnia, Legislation, Administrative agencies, Federal-state water rights conflicts, Area redevelopment, Planning, Water management (Applied), Water quality control, Water supply, Flood protection, Watershed management, Recreation, Hydroclectric power, Consumptive use, Diversion, Legal aspects.
Identifiers: *Susquehanna River Basin Compact.

By this act of Congress, the United States is made a signatory party to the Susquehanna River Basin Compact, set forth herein, with certain reservations. Because of the interstate and national interest in the water resources of the river basin area, the United States, Maryland, New York, and Pennsylvania agree to create a commission to provide central administration, and comprehensive planning and management. The commission is composed of the governor of each signatory state, or his designee, and one Presidential appointee. The commission may plan, construct, and operate any project necessary to the purposes of the Compact, establish water standards, collect data, and sponsor research. The commission shall plan and implement water resources projects, administer the basin water resources, and compel compliance with

the provisions of the Compact or regulations of the commission by court action. Areas over which the commission may exercise power include: (1) water supply, (2) water quality management and control, (3) flood protection, (4) watershed management, (5) recreation, (6) hydroelectric power, and (7) regulation of withdrawal and diversions. Provisions are made for financing and auxiliary powers. Congressional reservations as to specific provisions are set forth. (Smiljanich-Florida)
W71-07453

RIVERS AND HARBORS, FLOOD CONTROL ACTS OF 1970.

Public Law, No 91-611, 84 Stat 1818, 16 US Code Cong and Admin News, p 7824-7845 (1970). 22 p.

Descriptors: *Rivers and Harbors Act, *Flood control, *Engineering structures, *Water resources development, Legislation, Federal government, Administrative agencies, Legal aspects, Social aspects, Economic impact, Public benefits, Navigation, Erosion control, River basin development, Navigable rivers, Harbors, Adoption of practices, Federal budgets, Political aspects, Water conservation, Natural resources, Construction costs.
Identifiers: *Flood Control Act.

The construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, beach erosion prevention, and other purposes is hereby authorized in the Rivers and Harbors, Flood Control Acts of 1970. The Secretary of the Army, acting through the Chief of Engineers, is authorized to prosecute the specified works in accordance with the plans recommended. The various projects and studies included, and the river basins involved, are set forth. The Secretary of the Army is to see that possible adverse economic, social and environmental effects relating to any proposed project have been fully considered and that the final decisions on the project are made in the best overall public interest. The Secretary must take into consideration the need for flood control, navigation, and the cost of eliminating or minimizing adverse effects such as water pollution, destruction of man-made and natural resources and esthetic values, and community or regional disruption. The objectives to be included in federally financed water resource projects are the enhancement of regional economic development, the quality of the total environment, the well-being of the people of the United States, and the national economic development. (Smiljanich-Florida)
W71-07462

A MODERN PROPOSAL FOR STATE REGULATION OF CONSUMPTIVE USES OF WATER,
Frank E. Maloney, and Richard C. Ausness.
Hastings Law Journal, Vol 22, No 3, p 523-560, 1971. 158 ref.

Descriptors: *Administration, *Consumptive use, *Water utilization, *Permits, Regulation, Water rights, Prior appropriation, Riparian rights, Legislation, Legal aspects, Water supply, Water users, Water demand, Water resources, Administrative agencies, Water policy, Reasonable use, Beneficial use, Preferences (Water rights), Domestic water, Industrial water, Agriculture, Municipal water.
Identifiers: *Model Water Code.

Discussing a chapter from the draft Model Water Code, this article sets forth a proposed permit system regulating consumptive uses of water. The discussion is divided into five parts: (1) regulation of consumptive uses of water, (2) regulation under Eastern permit systems, (3) the constitutionality of legislation regulating water rights, (4) significant features of consumptive use permit systems, and (5) permits under the Model Water Code. The article first discusses the two doctrines governing water use: (1) the Eastern riparian system, and (2) the Western appropriation system. The riparian system should be modified because of its uncertainty and its lack of administrative controls, while the appropriation system is too rigid. Eastern permit systems are discussed cursorily, with emphasis on the Model Water Use Act and the Iowa Permit System. The article concludes that a modern interpretation of state police power would preclude constitutional challenges in most states. Important features of the Model Water Code are its reasonable-beneficial use standard, which seeks to prevent wasteful consumption of water, and the security provided water rights. In this latter regard the Code adopts a system of limited-term permits. Finally, the article sets forth the permit provisions of the Code with explanatory comment. (Duss-Florida)
W71-07481

A BILL TO PROVIDE FOR THE CONTROL AND PREVENTION OF POLLUTION, DETERIORATION OF WATER QUALITY, AND DAMAGE TO LANDS AND WATERS RESULTING FROM EROSION TO THE ROADBEDS AND RIGHTS-OF-WAY OF EXISTING STATE, COUNTY, AND OTHER RURAL ROADS AND HIGHWAYS.

Senate Bill 279, 92d Cong, 1st Sess (1971). 5 p.

Descriptors: *Bank stabilization, *Roadbanks, *Erosion control, *Sediment control, Soil conservation, Legislation, Federal government, State governments, Roads, Road construction, Drainage systems, Road design, Environmental engineering, Erosion, Bank erosion, Soil erosion, Damages, Sedimentation, Environmental effects, Disposition (Sediments), Sediment distribution, Channel erosion, Multiple-purpose projects, Administration, Cost sharing, Project planning.

Federal assistance in abating river and stream erosion and preventing erosion damage to rural roadbeds is proposed in this bill. The purposes of this bill include: (1) preservation of land and water resources, (2) maintaining water supply quality, (3) protecting fish and wildlife habitat and recreational values, (4) beautifying natural landscapes, (5) enhancing road safety, and (6) strengthening the rural economy. To carry out these policies the Secretary of Agriculture would be authorized to furnish financial assistance to state, county, and local agencies for the planning and installation of measures needed to prevent roadbed erosion. To prevent and control stream and river erosion and the accompanying damage to water and land resources, the Secretary would be authorized to: (1) assist states, counties, and local agencies--including soil and water conservation districts and nonprofit agencies--in formulating measures to prevent erosion and sediment damage; and (2) to assist in the implementation of such plans with financial, technical, or other assistance. As a condition to such assistance the state or agency must: (1) bear not less than twenty-five per cent of the costs; (2) acquire necessary land, easements, or rights-of-way; and (3) arrange for operational and maintenance costs. (Earl-Florida)
W71-07482

MARINE POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
Senate Bill 192, 92d Cong, 1st Sess (1971). 6 p.

Descriptors: *Water pollution control, *Pollution abatement, *Legislation, *Permits, Disposal, Sea water, Waste disposal, Environmental sanitation, Garbage dumps, Sanitary engineering, Legal aspects, Sewage disposal, Ultimate disposal, Waste dilution, Waste assimilative capacity, Water quality control, Federal government, Administrative agencies, Administrative decisions, Regulation, Great Lakes, Ecology, Oceans, Coasts, Industrial wastes.
Identifiers: Federal Water Pollution Control Act.

This proposed amendment to the Federal Water Pollution Control Act would require a permit for the disposal of refuse into the Great Lakes, coastal waters, or high seas. Such permits, applicable to refuse material originating within the United States, would be granted by the Administrator of the Environmental Protection Agency. Upon receipt of permit applications, the Administrator would investigate the: (1) refuse's characteristics; (2) physical, biological, and ecological impacts of disposal; and (3) the proposed manner of disposal. A comprehensive report would then be prepared for inclusion in the record of one or more mandatory public hearings. After the closing of public hearings the Administrator would be required to make public written findings of fact, conclusions, and a decision. No decision granting a permit could be made without clear and convincing evidence that the disposal activity would not endanger: (1) public health, (2) plant or animal life, (3) physical processes, (4) food chains, or (5) marine ecology or environment. No decision granting a permit could become final absent affirmative concurrence by the Council on Environmental Quality. Temporary permits would be available where technical difficulties prevented the disposal of refuse in compliance with this bill. (Earl-Florida)
W71-07483

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.

Senate Bill 1012, 92d Cong, 1st Sess (1971). 12 p.

Descriptors: *Grants, *Water pollution control, *Legislation, *Financing, Federal government, Administration, State governments, Interstate, Interstate commissions, Interstate compacts, Pollution abatement, Administrative agencies, Capital supply, Waste treatment, Water purification, Water quality control, Water pollution treatment, Permits, Integrated control measures, Treatment facilities, Project planning, Cost repayment, Cost sharing, Costs, Administrative costs.
Identifiers: Federal Water Pollution Control Act.

A system of water pollution control grants and appropriations would be established under this proposed amendment to the Federal Water Pollution Control Act. Basic state water pollution control grants would be based upon: (1) population, (2) extent of pollution, and (3) financial need. Reasonable regulations would govern basic grants to interstate agencies. Administrative and personnel training costs could be included in basic grants. State or interstate agency plans would be eligible for approval if they: (1) provided for adequate administration; (2) contained reporting requirements; (3) set forth plans, policies, and methods; (4) contained extension or improvement provisions; (5) provided budgetary controls; and (6) contained acceptable priority criteria. Upon assurance that an improved water pollution control program was being developed, additional grants not exceeding twenty-five per cent of the state or agency's federal share, as defined by the amendment, could be provided. The elements of an improved program include: (1) a mandatory waste permit system, (2) a sewage treatment program, (3) personnel training programs, (4) recruitment programs, and (5) an adequate planning program. Bonus grants, not exceeding forty per cent of the federal share, could be provided upon a showing that one or more improved elements have been developed. Otherwise unexpended funds would be available for 'exceptional' programs. (Earl-Florida)
W71-07484

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FINANCIAL ASSISTANCE FOR RIVER BASIN PROGRAMS.

Senate Bill 601, 92d Cong, 1st Sess (1971). 4 p.

Descriptors: *Water quality control, *Basin, *Grants, *Financing, Federal government, Watersheds (Basins), Groundwater basins, Integrated control measures, Legislation, Cost repayment, Government finance, Government support, Administrative agencies, Interstate compacts, Sta

ernments, Participating funds, Reimbursable
ts, Specific costs, Water resources develop-
nt, Treatment facilities, Waste treatment, Water
lution control, Administration, Administrative
ts.
ntifiers: *Water Pollution Control Act.

roposed amendment to the Federal Water Pol-
on Control Act, this bill would authorize grants
ntrastate basin water quality management agen-
. Up to fifty per cent of agency administrative,
estigatory, operator training, and inspection
ts would be financed through such grants.
nts would beconditioned upon a determination
(1) consistency with applicable water quality
dards, (2) appropriate state approval, and (3)
e capability to execute plans. Interstate
rological units would be eligible with state
slative approval. Basin plans must provide com-
hensive water quality management, including:
waste-source control; (2) waste treatment
lity construction, operation, and maintenance;
flow control, diversion, or impoundment; and
waste treatment financing and cost distribution
niques. Basins include rivers or portions of
rs, streams, tributaries, coastal waters, sounds,
aries, ways, lakes and related land resources
ning a hydrological unit. Water and land situ-
d in a single metropolitan area are not eligible as
ins. Grants are not to exceed three years, but
y be renewed or extended. Agencies receiving
h grants shall not be eligible for other Federal
ter Pollution Control Act grants. (Earl-Florida)
1-07485

LLUTION AND THE LAW IN ILLINOIS,
uglas W. Graham.
cago Bar Record, Vol 52, No 4, p 205-214,
1. 32 ref.

scriptors: *Illinois, *Water pollution control,
llution abatement, *Legislation, Water policy,
ter pollution, Air pollution, Federal govern-
nt, State governments, Local governments, Ci-
, Water districts, Environment, Federal jurisdic-
n, State jurisdiction, Administrative agencies, In-
utions, Regulations, Industries, Standards, In-
state rivers, Legal aspects, Non-structural alter-
ives.

reased concern for environmental quality has
ulted in the creation of a diverse and complex
ly of laws, ordinances and regulations. A discus-
n of the laws and ordinances controlling pollu-
n in Illinois and the jurisdiction and interactions
the federal, state, and local agencies enforcing
m reveals the varied standards to which industry
d citizens are subjected. Federal standards and
forcement procedures are examined. The Illinois
vironmental Protection Act effected com-
hensive change upon Illinois pollution law by
ating centralized pollution control institutions.
e various functions of these institutions are
cussed, along with the enforcement of pollution
s. Powers of the state, counties, cities, and sani-
y districts often overlap. Cities, although without
clusive responsibility for regulation and enforce-
nt, can provide essential services in cases such
small or short-duration violations where it may
difficult or impossible to bring state investigative
wers to bear quickly. Industries under concur-
t pollution control of different agencies should
mply with the most rigorous regulation to which
y are subject. The Illinois Act and improved en-
cement have enhanced the prospects for a better
vironment. (Smiljanich-Florida)
71-07486

E AREA OF ORIGIN AND A COLUMBIA VER DIVERSION,
lph W. Johnson.
ashington Law Review, Vol 46, No 2, p 245-281,
71. 128 ref.

scriptors: *Columbia River, *Columbia River
sin, *Inter-basin transfers, *Water transfer, In-
state rivers, Rivers, River basins, Basins, River basin development, River systems, Legal aspects, Diversion, Withdrawal, Planning, Water allocation (Policy), Water resources, Water resources development, Water utilization, Water supply, Water rights, Water sources.

A possible diversion of the Columbia River to the southwest is the subject of this article. The conflicts between area-of-origin protection and the needs of states out of the river basin are considered. The problem is discussed in light of problems which have arisen in California, Colorado, Nebraska, Texas, and Oklahoma. The following methods have been used to allocate interstate waters: (1) agreements between water users, (2) reciprocal legislation, (3) interstate compacts, (4) interstate litigation, and (5) congressional allocation. Congressional allocation is the most practical method, and congressional mandates in the area are superior to state regulations. A history of state and federal legislation is examined and evaluated in light of the possible diversion of the Columbia River. The author maintains that the Pacific Northwest should not continue total resistance to all studies dealing with diversion. If the water crisis continues in the Southwest, then Congress will probably enact a diversion statute with respect to which the Northwest may not have its interests fully protected. (Robinson-Florida)
W71-07487

SURFACE WATER IN SOUTH CAROLINA,
William T. Toal.
South Carolina Law Review, Vol 23, No 1, p 82-92, 1971. 76 ref.

Descriptors: *South Carolina, *Surface runoff, *Repulsion (Legal aspects), *Riddance (Legal aspects), Surface drainage, Water spreading, Surface waters, Drainage water, Overland flow, Storm runoff, Water sources, Runoff, Water law, Legal aspects, Damages, Compensation.

The law of surface waters in South Carolina is the subject of this note. There are three basic rules for the disposal of surface waters: (1) the common enemy rule, (2) the civil law rule, and (3) the reasonable use rule. South Carolina generally follows the common enemy rule, which allows every landowner to protect his porperty from surface waters even if he throws it back upon a coterminous landowner to his damage. However, landowners may not create a nuisance in disposing of surface waters. This exception has been very limited in use. Another exception is that a landowner cannot collect surface waters in an artificial channel and discharge it in concentrated form upon his neighbor's land. The author maintains that the rejection of negligence and reasonable use concepts is consistent with the common enemy rule but no longer makes any sense because South Carolina has become less agrarian. The South Carolina constitution provides that private property shall not be taken for public use without compensation. This clause has been used to hold the state liable for damages caused by the state with surface waters. (Robinson-Florida)
W71-07488

PROPOSED AGREEMENT FOR ASSUMPTION OF CERTAIN AEC REGULATORY AUTHORITY.
Federal Register, Vol 35, No 220, p 17369-17375, Wednesday, November 11, 1970.

Descriptors: *Maryland, *Nuclear wastes, *Radioactive waste disposal, *Water pollution control, Administrative agencies, Administrative decisions, Regulation, Administration, Nuclear powerplants, Nuclear reactors, Radioactive wastes, Water pollution sources, Pollutants, Pollution abatement, Waste disposal, Federal government, Water pollution, Water pollution treatment, Water quality, Water quality control, Legal aspects, Water resources, Jurisdiction, State jurisdiction.

Notice is hereby published of a proposed agreement received from the Governor of Maryland which provides for the assumption of certain of the Atomic Energy Commission's authority pursuant to section 274 of the Atomic Energy Act. The Commission herein publishes a proposed memorandum of understanding between the State of Maryland and the Commission which would accompany the agreement. The memorandum is drafted to facilitate agreement with the state, pending resolution of the jurisdictional issue raised by the Maryland Department of Water Resources in attempting to impose limits upon radionuclide concentrations in liquid wastes discharged by a Baltimore Gas and Electric Company's nuclear power station. The proposed agreement would give the state regulatory authority over the disposal into the ocean or sea of byproducts, sources, or special nuclear waste materials. The proposed memorandum specifies that nothing therein nor in the proposed agreement shall affect their respective legal position on the question raised by the Maryland Department of Water Resources. (Robinson-Florida)
W71-07489

PUBLIC USE OF CERTAIN LAKE AND RESERVOIR AREAS.
Corps of Engineers, Washington, D.C.

Federal Register, Vol 36, No 45, p 4494-4498, Saturday, March 6, 1971.

Descriptors: *Lakes, *Reservoirs, *Recreation, *Regulation, Public benefits, Boating, Camping, Fishing, Hunting, Swimming, National parks, Recreation facilities, Water policy, Boats, Federal government, Administration.

Regulations are promulgated by the Corps of Engineers for public use of lakes and reservoirs in the states of: Arkansas, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, and West Virginia. Specific sites are listed in each state, and the following subjects are regulated: boating, swimming, hunting and fishing, camping, picnicing, access to public waters, destruction of public property, use of firearms and explosives, gasoline storage, sanitation, advertisements, solicitation for business, commercial operations, recreational activity programs, abandonment of personal property, discrimination, control of animals and pets, visiting hours, noise, and vehicles. (Hart-Florida)
W71-07490

SALINE WATER CONVERSION PROGRAM--APPROPRIATION.
HR Rep No 858, 91st Cong, 2d Sess, 4 US Code Cong and Admin News, p 764-769, 1970. 6 p.

Descriptors: *Saline water, *Desalination, *Desalination plants, *Legislation, Federal government, Administrative agencies, Administration, Budgeting, Financing, Government finance.

The legislative history of Public Law 91-221, an appropriations measure for the saline water conversion program, is set forth in this House report. The stated purpose of the bill is to authorize appropriations for continuance of the desalting research program of the Department of the Interior. Federal activity in the area began in 1952. The program has enlarged in scope and duration, and annual appropriations are now required. The present bill is the second annual appropriation. Committee amendments: (1) reduced the authorization by $500,000, (2) conveyed limited authority for foreign research, (3) deleted changes in the basic act, and (4) provided technical and clarifying language. Categories of activities for which expenditures have been established are: (1) research and development--$16,650,000; (2) development of

saline water conversion test beds--$5,000,000; (3) development of saline water conversion modules--$5,345,000; and (4) administration and coordination--$2,378,000. The report expresses confidence in the present management of the saline water conversion program, resulting from prudent utilization of prior appropriations and the achievement of discernable results. (Hart-Florida)
W71-07491

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
Conf Rep No 940, 91st Cong, 2d Sess, 4 US Code Cong and Admin News, p 830-868, 1970. 39 p.

Descriptors: *Water qulaity control, *Environment, *Administrative agencies, *Pollution abatement, Pollutants, Oil, Oil industry, Water pollution, Water pollution control, Water pollution sources, Water quality, Administration, Federal government, United States, Ships, Sewage, Sewage disposal, Legislation, Ecology, Legal aspects, Alaska.
Identifiers: *Water and Environ. Quality Improv. Act.

Since the Senate and House of Representatives disagreed as to an amendment to the Federal Water Pollution Control Act, called the Water and Environmental Quality Improvement Act of 1970, a joint conference was held to draft a mutually-agreeable amendment. The House bill, Senate amendment, and compromise substitute provisions for control of pollution by oil are discussed first. The counterpart House, Senate, and compromise solutions to the following problem areas are set forth and cover: (1) control of hazardous polluting substances; (2) control of sewage from vessels; (3) area acid and other minewater pollution control demonstrations; (4) pollution control in the Great Lakes; (5) training grants and contracts; (6) Alaska village facilities; (7) cooperation by federal agencies in the control of pollution; (8) awards for excellence; (9) research, investigations, training, and information; (10) Oil Pollution Act of 1924; (11) financing study; (12) name change; (13) reimbursement; (14) navigation; and (15) environmental quality. (Hart-Florida)
W71-07492

THE LAW OF WATER USAGE,
Charles W. Wixon, and Karl F. Zeisler.
In: Industrial Uses of Water in Michigan, p 102-136, Bureau of Business Research, University of Michigan, Ann Arbor, 1966. 1 tab, 25 ref.

Descriptors: *Michigan, *Reasonable use, *Prior appropriation, *Consumptive use, Water Quality Act, Water Resources Planning Act, Rivers and Harbors Act, Legislation, Water rights, United States, Federal jurisdiction, Federal-state water rights conflicts, Waste disposal, Water users, Water pollution, Judicial decisions, Riparian rights, Artificial use, Pollution abatement, Remedies, Nuclear wastes, Administrative agencies, Legal aspects, Water law.

This discussion of water law and legislation in the United States, and specifically Michigan, reveals the weaknesses of the present situation. Federal jurisdiction has been extended over all navigable waters, thus creating federal-state conflicts. The federal Water Quality Act and Water Resources Planning Act have created mixed fears among the states, especially as to the former. While federal law deals with disposal of water wastes, state laws cover rights to use water. These state laws, based largely on common law, are not clear. There are few Michigan statutes in the area. The two basic common law doctrines in the United States are the Eastern reasonable use doctrine, applicable in Michigan, and the Western prior appropriation doctrine. A discussion of their differences points to the inherent weaknesses of the reasonable use doctrine. The larger the user or the number of users, the weaker is the law. Legislation and water laws of other states are discussed. Water law must be put on a statutory basis, as the common law has led to many unsolved problems. The Model Water Act provides a flexible starting point for the task. (Smiljanich-Florida)
W71-07493

OIL POLLUTION OF COASTAL AND INLAND WATERS OF THE UNITED STATES UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970,
Alfred A. Lohne.
Insurance Counsel Journal, Vol 38, No 1, p 49-62, 1971. 73 ref.

Descriptors: *Oil wastes, *Accidents, *Water pollution control, *Pollution abatement, Damages, Oily water, Water pollution sources, Water pollution treatment, Oil, Ships, Federal government, Legislation, Legal aspects, Remedies, Water pollution, Water pollution effects, Jurisdiction, Rivers and Harbors Act.
Identifiers: *Water Quality Improv. Act.

Oil pollution of coastal and inland waters, as affected by the Water Quality Improvement Act of 1970, is the central topic of this article. Discussed as the background for the Water Quality Improvement Act are: (1) the Water Pollution Act of 1886, (2) the River and Harbor Act of 1899, (3) the Oil Pollution Act of 1924, (4) the Oil Pollution Act of 1961, and (5) the 1966 Clean Water Restoration Act. The Water Quality Improvement Act provides for: a National Contingency Plan, a basis and amount of liability, claims against the United States, jurisdiction, evidence of financial responsibility, direct suits against underwriters, and offshore rigs. The Act does not concern private suits, but the National Contingency Plan will greatly assist private landowners in cleaning their lands and waters. While the Act will not prevent all accidents, it provides measures for a rapid cleanup at the expense of the polluter. These expenses will be recoverable in the appropriate district court. There are four exceptions to the strict liability of the polluter: (1) an act of God, (2) an act of war, (3) negligence on the part of the United States, and (4) an act or omission of a third party. (Robinson-Florida)
W71-07494

PROTECTING OUR ENVIRONMENT AND NATURAL RESOURCES IN THE 1970's,
For primary bibliographic entry see Field 05G.
W71-07495

PROMISING AREAS FOR RESEARCH ON INSTITUTIONAL DESIGN FOR WATER RESOURCES MANAGEMENT,
Wisconsin Univ., Madison. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 06B.
W71-07498

A NEW LOOK AT NATIONAL WATER POLICY,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W71-07500

ECONOMIC AND INSTITUTIONAL ASPECTS OF WATER TRANSFERS IN NORTHWEST NEVADA,
Nevada Univ., Reno. Dept. of Agricultural and Resource Economics.
John G. McNeely.
Agricultural Experiment Station Report B27, Jan 1971. 29 p, 12 tab, 1 fig, 27 ref.

Descriptors: *Water transfer, Inter-basin transfers, Water users, *Appropriation, Water rights, *Institution, Evaluation, *Nevada.
Identifiers: *Truckee River Basin, Truckee-Carson Irrigation District, Sierra Pacific Power Company.

Although the author describes how Nevada's ap propriative type of water law has worked relativel well, he states that 'it would be erroneous to cor clude that its operation cannot be improved.' B focusing on the Truckee River Basin i northwestern Nevada he was able to study specif cally how water rights have been transferred fro one use to another in Nevada and the role that leg and institutional arrangements have played in thes transfers. Since 1944, the author stated, 18,32 acre-feet of water transfers have taken place on th Truckee River, representing primarily change from irrigation to municipal and industrial uses. H concludes that if improvements in Nevada's leg and institutional arrangements were made, such a enforcement of Nevada's law regarding non-use water, non-transferability of Newland Proje water and offering incentives for more efficient us of water, increased water transfers could take plac and the economy of the Truckee River Basin cou gain increased benefits. (Holmes-Rutgers)
W71-07504

EFFICIENT DISTRIBUTION OF RESOURCE THROUGH THREE LEVELS OF GOVERN MENT,
Dalhousie Univ., Halifax (Nova Scotia); and Tex Univ., Austin, Tex.
R. M. Cassidy, M. J. L. Kirby, and W. M. Raike.
Management Science, Vol 17, No 8, B462-B47 Apr 1971.

Descriptors: *Resource allocation, Decision-ma ing, Economic efficiency, Cost, Budget constrain Dynamic programming, Cost.
Identifiers: *Algorithm, Objective functio Parametric statistics, Matrix.

This paper presents a model for determining how central government or authority can most ef ciently allocate resources among other levels government. The model takes into account bo the initial allocation by the higher level governme body and the usage of resources that is determin by the lower level unit. A key feature of the mod is the mathematical formulation of the cent government's objective of distributing resources ficiently while at the same time being as fair possible to all those receiving allocations. T authors then propose a solution technique whi uses either parametric analysis or dynamic pr gramming. Illustrative examples are given to clari the model and the solution approach. This article relevant to water research concerned with inte governmental budgetary relations and resource location. (Siegenthaler-Rutgers)
W71-07579

THE SYMMETRY APPROACH TO COMMI TEE DECISIONS: AN EMPIRICAL STUDY OF LOCAL GOVERNMENT BUDGET COMMI TEE,
Wayne State Univ., Detroit, Mich.
For primary bibliographic entry see Field 06B.
W71-07588

BUDGETING AND DECISIONMAKIN PROCESS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 06B
W71-07594

LAW AND THE MUNICIPAL ECOLOGY, A WATER, NOISE, OVER-POPULATION,
National Inst. of Municipal Law Officers, Washi ton, D.C.
Stuart F. Lewin, Alan H. Gordon, and Channing Hartelius.
NIMLO Research Report 156, 1970. 243 p.

Descriptors: *Legislation, *Air pollution, *Wa pollution, Human population, *Ecology, *Soc aspects, *Legal aspects.
Identifiers: Federal regulations, Interstate co pacts, State regulations, Local regulations.

e major municipal pollution problems result
m man's interaction with his environment. To
prove this municipal environment the city attor-
y must be provided with the legal means to bring
out the desired relationship. The definition,
ype, types, and effects of pollution are con-
ered in conjunction with the role of municipal
. A discussion of the federal, state and mu-
ipal regulations for the city attorney's enforce-
nt of controls on over-population and air, water,
d noise pollution is presented. (Ensign-PAI)
71-07670

ATER RESOURCES ACTIVITIES IN THE
ITED STATES-POLLUTION ABATEMENT.

nate Select Comm on National Water Resources,
es 48, 86th Cong, 2d Sess (1960). 38 p, append.

scriptors: *Water pollution sources, *Water pol-
ion effects, *Domestic wastes, *Industrial
stes, Water pollution, Organic wastes, Sewage
posal, Wastes, Waste treatment, Water pollution
atment, Water quality, Sewage disposal, Mu-
ipal wastes, Sewage, Waste water (Pollution),
llutant identification, Organic acids, Inorganic
mpounds, Organic pesticides, Thermal pollution,
llutants, Pollution abatement, Radioactive
stes, Radioactive waste disposal, Groundwater.

ater polluting substances are classified and
cussed in eight general categories: (1) oxygen
manding wastes, including sewage; (2) infectious
nts; (3) plant nutrients; (4) organic chemical
otics including detergents and pesticides; (5)
ner chemical and mineral substances; (6) sedi-
nts; (7) radioactive substances; and (8) heat.
ecial problems involving all categories are
cussed with relation to industrial and municipal
stes, with emphasis on the effects of pollutants
potential uses of the affected waters, problems
groundwater pollution and the effects of such
llution on future water needs. Numerous charts
d tables illustrate pollutant loads, waste treat-
nt and pollution elimination costs projected to
e year 2000, and prevalence of various pollutants
different areas. Appendices treat pollution-re-
cd subjects in thirteen water resources regions.
ye-Florida)
71-07674

IE USE OF TAXES, SUBSIDIES, AND REGU-
ATIONS TO EFFECT AN IMPROVED ALLO-
ATION OF WATER RESOURCES,
emson Univ., S.C. Water Resources Research
t.
Macaulay.
nal Report, Aug 1967. 24 p, 3 fig, 14 ref. OWRR
oject A-008-SC (1).

escriptors: *Regulations, *Subsidies, *Taxes,
Water allocation (Policy), Water pollution, Water
llution control, Water pollution treatment, Pol-
ants, Pollution abatement, Water resources, Ef-
ents, Administrative agencies, Distribution,
eferences (Water rights), Water demand, Water
pply.

ater, long considered plentiful, is becoming so
arce as to require a means of allocation. Since
ter has not been subject to private ownership,
d there has been no general supervision of water
age, the problems of water allocation are more
mplex than with other commodities. The solu-
ns most often proposed for water allocation are:
) regulations imposed by governments for water
e; (2) subsidies to be granted to firms and mu-
cipalities for the removal of wastes which lower
ter quality; and (3) a tax or effluent charge
ied on wastes discharged into streams or other
dies of water. Evaluation of these proposals in-
cates that, although regulations could provide for
timum economic water use, they have not ac-
mplished that objective. Despite the assertion
at effluent charges are licenses to pollute, such
arges do not license the unlimited discharge of
llutants, but of only specified amounts. Subsidies
r pollution abatement, since financed by all tax-
payers, are the most just means of water allocation and pollution control. (Hart-Florida)
W71-07686

PREDICTION OF WATERSHED DEVELOPMENT SUCCESS OF LOCAL COMMUNITIES,
Department of Agriculture, Upper Darby, Pa. Economic Research Div.
For primary bibliographic entry see Field 06B.
W71-07694

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.
For primary bibliographic entry see Field 05G.
W71-07697

6F. Nonstructural Alternatives

AN EVALUATION OF RELATIONSHIPS BETWEEN STREAMFLOW PATTERNS AND WATERSHED CHARACTERISTICS THROUGH THE USE OF OPSET: A SELF CALIBRATING VERSION OF THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07063

PROTECTING OUR ENVIRONMENT AND NATURAL RESOURCES IN THE 1970's,
For primary bibliographic entry see Field 05G.
W71-07495

6G. Ecologic Impact of Water Development

ENVIRONMENTAL CONSIDERATIONS IN THE RECYCLING OF HIGH TEMPERATURE WATER,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07161

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07215

INFORMATION FOR THE FUTURE: THE WEST SIDE SAN JOAQUIN VALLEY PROJECT.
California Univ., Los Angeles. Water Resources Center.
For primary bibliographic entry see Field 06B.
W71-07241

ENVIRONMENTAL IMPACT OF THE CROSS-FLORIDA BARGE CANAL WITH SPECIAL EMPHASIS ON THE OKLAWAHA REGIONAL ECOSYSTEM.
Florida Defenders of the Environment, Inc., Gainesville.

Report of Florida Defenders of the Environment, Gainesville, Fla, Jan 1971. 33 fig, 1 tab, 10 ref.

Descriptors: *Canal construction, *Ecology, *Geology, *Hydrology, *Land use, *Economics, Ecosystems, Construction, Florida.

The United States Army Corps of Engineers is constructing the Cross-Florida Barge Canal. The environmental impact of this construction has been studied with emphasis on the ecosystem of the Oklawaha region. The principal findings of studies in geology, ecology, hydrology, economics, land use planning, and environmental quality are summarized. Recommendations from these findings are suggested. (Ensign-PAI)
W71-07332

CONFLICTS OF RECREATION AND OTHER USES OF THE GREAT LAKES,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-07570

A GEOLOGIST VIEWS THE ENVIRONMENT,
Illinois State Geological Survey, Urbana.
John C. Frye.
Illinois Geological Survey Environmental Geology Notes, No 42, Feb 1971. 9 p.

Descriptors: *Land use, *Geology, *Environment, *Reviews, *Earth (Planet), Geomorphology, Evaluation, Methodology, Urbanization, Land use, Waste disposal, Water supply, Mineralogy, Structures, Water resources.
Identifiers: *Environmental geology.

The contributions of the earth scientist to environmental problem solving are discussed under five general categories. The first of these is collecting data for planning the proper use of the terrane, or the most efficient adjustment of man's use of the earth's surface to all of the physical features and characteristics at and below the surface - particularly in expanding urban areas. Second is determination of the factors that influence the safety and permanence of disposal of waste materials and trash of all kinds - both in the rocks near the surface and at great depth in mines and wells. Third is providing information for the planning and development of safe, adequate, and continuing water supplies in locations that will serve populated areas. Fourth is the identification of rock and mineral resources to provide for future availability of needed raw materials, or of appropriate substitute materials. And, fifth is the recognition of man as a major geologic agent by monitoring the changes he has caused in his environment and by providing remedies where these changes are, or may become, harmful. (Woodard-USGS)
W71-07605

LAW AND THE MUNICIPAL ECOLOGY, AIR, WATER, NOISE, OVER-POPULATION,
National Inst. of Municipal Law Officers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07670

A DETAILED ANALYSIS OF CLIMATOLOGICAL AND HYDROLOGICAL RECORDS OF SOUTH FLORIDA WITH REFERENCE TO MAN'S INFLUENCE UPON ECOSYSTEM EVOLUTION,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 02A.
W71-07672

07. RESOURCES DATA

7A. Network Design

A PROPOSED STREAMFLOW DATA PROGRAM FOR ARKANSAS,
Geological Survey, Little Rock, Ark.
James L. Patterson.
Geological Survey Open-file Report, 1969. 43 p, 3 fig, 4 tab, 6 ref, append.

Descriptors: *Streamflow, *Network design, *Data collections, *Arkansas, Planning, Hydrologic data, Stream gages, Regression analysis, Natural flow, Regulated flow, Surface waters, Gaging stations.
Identifiers: Streamflow-data evaluation.

An evaluation of the streamflow data available in Arkansas was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of the long-term goals of the streamflow data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining objectives. Many of the goals could be met by generalization of the data for gaged basins by regression analysis. Changes can be made in the present data program to attain the goals that have not been met. A streamflow data program, based on the guidelines developed, is proposed. (Woodard-USGS)
W71-07254

A PROPOSED STREAMFLOW DATA PROGRAM FOR PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
Leland V. Page.
Pennsylvania Department of Forests and Waters Technical Bulletin No 3, 1970. 55 p, 3 fig, 4 tab, 10 ref, append.

Descriptors: *Streamflow, *Network design, *Pennsylvania, *Data collections, Reviews, Planning, Stream gages, Natural flow, Regulated flow, Hydrologic data, Gaging stations, Flow characteristics.
Identifiers: *Streamflow characteristics.

An evaluation of the streamflow data available in Pennsylvania was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of the long-germ goals of the streamflow-data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining objectives. It was found that many of the goals could be met by generalization of the data for gaged basins by regression analysis. A stream-flow-data program based on the guidelines developed in this study is proposed. The current network is reasonably comprehensive but additional stations are needed to better define the limestone-sandstone index. (Woodard-USGS)
W71-07299

A PROPOSED STREAMFLOW DATA PROGRAM FOR MARYLAND AND DELAWARE,
Geological Survey, Towson, Md.
William E. Forrest, and Patrick N. Walker.
Geological Survey Open-file Report, 1970. 41 p, 1 fig, 8 tab, 6 ref, 1 plate, append.

Descriptors: *Streamflow, *Network design, *Data collections, *Maryland, Planning, Hydrologic data, Stream gages, Regression analysis, Flow characteristics, Natural flow, Regulated flow, Gaging stations.
Identifiers: Streamflow-data evaluation, Streamflow characteristics.

An evaluation of the streamflow data available in Maryland and Delaware provides guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of long-term goals of the streamflow data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining goals. Although most of the goals were not met by generalization of the data for gaged basins by regression analysis, it is still possible to make significant changes in the present data program to assist in attaining the goals. A streamflow data program based on the guidelines developed is proposed for the future. (Woodard-USGS)
W71-07300

A PROPOSED STREAMFLOW DATA PROGRAM FOR MINNESOTA,
Geological Survey, St. Paul, Minn.
William B. Mann, IV, and Charles R. Collier.
Geological Survey Open-file Report, Sept 1970. 75 p, 4 fig, 8 tab, 10 ref.

Descriptors: *Streamflow, *Network design, *Data collections, *Minnesota, Planning, Hydrologic data, Stream gages, Regression analysis, Flow characteristics, Natural flow, Regulated flow, Gaging stations.
Identifiers: Streamflow-data evaluation.

An evaluation of the streamflow data in Minnesota provides guidelines for planning future programs. The principal steps in this evaluation were (1) establishing the objectives and goals of the program, (2) examining and analyzing all available data to determine which of the goals have been met, (3) considering alternate means of meeting the remaining goals, and (4) identifying elements that should be included in the future program. Regression analysis of generalized data did not meet the established accuracy criteria. Significant changes must be made in the present data-collection program to meet these goals. Analysis on a regional basis is one way in which the accuracy can be improved. There are 105 current-purpose stations which should be continued as well as 137 crest-stage partial-record stations and about 400 low-flow sites. Seven minor stream-gaging stations and 13 natural-flow, principal-stream stations are recommended for discontinuance. Establishment of 53 new gaging stations is recommended. (Woodard-USGS)
W71-07301

A PROPOSED STREAMFLOW-DATA PROGRAM FOR MONTANA,
Geological Survey, Helena, Mont.
F. C. Boner, and G. W. Buswell.
Geological Survey Open-file Report, 1970. 96 p, 4 fig, 9 tab, 16 ref.

Descriptors: *Streamflow, *Network design, *Data collections, *Montana, Planning, Hydrologic data, Stream gages, Regression analysis, Natural flow, Regulated flow, Surface waters, Gaging stations.
Identifiers: Streamflow characteristics, Data evaluation.

An evaluation of the streamflow data available in Montana was made to provide guidelines for planning future programs. The basic steps in the evaluation procedures were (1) definition of the long-term goals of the streamflow data program, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternatate programs and techniques to meet remaining goals. Only one of the goals was met by generalization of the data for gaged basins by regression analysis. The regression method may be more successful at a future time if a more suitable model can be developed, and if an adequate sample of streamflow records can be obtained. In the meantime, other methods of transferring flow characteristics which require some information at the ungaged site may be used. A streamflow data program, based on the guidelines developed, is proposed. (Woodard-USGS)
W71-07302

PERIODIC REPORT OF THE WATER QUALITY SURVEILLANCE NETWORK, 1965 THRU 1967 WATER YEARS.
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05A.
W71-07635

A PROPOSED STREAMFLOW-DATA PROGRAM IN ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
Joseph M. Childers.
Geological Survey Alaska District Open-file Report, 1970. 55 p, 7 fig, 9 tab, 5 ref, 2 append.

Descriptors: *Streamflow, *Network design, *Da collections, *Alaska, Planning, Gaging station Stream gages, Hydrologic data, Regression anal sis, Natural flow, Regulated flow, Surface wate Precipitation (Atmospheric).
Identifiers: Streamflow characteristics, Da evaluation.

The streamflow-data program in Alaska w analyzed to design a better data collection networ The analysis included (1) definition of the goals the streamflow-data program, (2) evaluation of t available data to see which goals have already be achieved, and (3) consideration and recommend tion of future programs to achieve the goals th have not been met. Few of the goals have been m Many new gaging stations are proposed to provi data to reach the remaining goals. Also, other da collections are proposed to supplement the gagi station data. (Woodard-USGS)
W71-07636

7B. Data Acquisition

ADVANCING TECHNOLOGY IN ELECTRON SURVEYING,
Plessey Electronics Corp., Farmingdale, N.Y.
C. G. Romaniello.
Proceedings American Society of Civil Engine Journal of the Surveying and Mapping Divisi Vol 96, No SU2, p 287-297, Sept 1970. 11 p, 3 5 tab, 5 ref, 2 append.

Descriptors: Accuracy, *Measuring instrume Distance, Electronics, *Electronic equipme Geodimeters, Microwaves, Performance, *Surv ing instruments, Refractivity, *Surveyi Technology, History, Radio waves, Radar, Err Infrared radiation, Light waves, Tellurometers.
Identifiers: Resolution.

Changes in electronic distance measurem equipment have evolved rapidly and dramatica The use of higher frequencies with resulting n rower beam widths and higher resolutions has c curred with the advances in electronics. P formance capabilities of the earlier microwave struments in the X and S band categories analyzed and equations applied. Values of ref tive indexes and the accuracy limiting factors discussed. Equipment comparison tables show range and accuracies of available instruments. more modern high-accuracy devices and the proved techniques required for full capitaliza on their capabilities are reviewed. Future tre are outlined as they are predicated on the chan needs of the involved professions. (USBR)
W71-07071

STUDIES OF PROPERTIES AND CONDITI OF ROCK MASSIFS BY SEISMIC ACOUST METHODS,
Vsesoyuznyi Nauchno-Issledovatelskii Ins Gidrotekhniki i Meloratsii, Moscow (USSR).
For primary bibliographic entry see Field 08E.
W71-07074

DETERMINATION OF IN SITU HYDRAU PARAMETERS IN JOINTED ROCK,
Imperial Coll. of Science and Technology, Lon (England).
For primary bibliographic entry see Field 02F.
W71-07075

A NEW AUTOMATIC DETERMINATION OXYGEN IN ORGANIC SUBSTANCES COLORIMETRIC TITRATION, (IN GERMA
Badische Anilin- und Soda-Fabrik A.G., wigshafen am Rhein (West Germany)
For primary bibliographic entry see Field 05A.
W71-07349

ESTIGATION OF PHOTOSYNTHETIC ANSIENTS IN CHLORELLA USING DIOACTIVE CARBON DIOXIDE (IN GER-N),
nkfurt Univ. (West Germany). Botanical Inst.; Tuebingen Univ. (West Germany). Institut Chemische Pflanzenphysiologie.
Doehler, and K. Wegmann.
lish summary. Planta, Vol 89, p 266-274, 1969.
, 13 ref.

criptors: *Investigations, *Radioactivity niques, Photosynthesis, Chlorella, Data collec-s, Radioactivity.
tifiers: *Photosynthetic transients, Chlorella garis, Carbon dioxide-14, Calvin cycle, Pho-spiration, Carboxylation pathways.

strain 211-11f of Chlorella vulgaris, grown a low concentration of carbon dioxide, was d as the test plant. Under conditions of the stu-conducted in environment with 0.7% carbon ide, by volume, no transients in carbon diox-14 fixation was observed. Autoradiographic in-igation showed at the beginning of illumination appearance of radioactivity in the inter-diates of the Calvin cycle. After two minutes e radioactivity was incorporated in malate and artate. Under the influence of iodoacetamide in centration of 0.001 M, the radioactivity was ated in malate, aspartate, and 3-sphoglycerate. Consideration is given to the nation of the transients by two different ways of carboxylation and the role of pho-spiration. (Wilde-Wisconsin)
1-07350

OTOSYNTHETIC COEFFICIENT AS A NCTION OF THE COMPOSITION OF ANT BIOMASS, (IN RUSSIAN),
itut Mediko-Biolozicheskikh Problem, Moscow SSR).
primary bibliographic entry see Field 05C.
1-07359

NTINUOUS MONITORING OF AROMATIC MPOUNDS IN WATER BY DIFFERENTIAL OTOMETRY,
Pont de Nemours (E. I.) and Co., Wilmington,
primary bibliographic entry see Field 05A.
1-07404

NEW RAPID METHOD FOR THE PRODUC-ON OF PERMANENT STAINED SLIDES OF RINE PLANKTON,
nnecticut Coll., New London. Marine Science gram.
primary bibliographic entry see Field 05A.
1-07408

TOMATED COUNTING OF MICROBIAL LONIES,
nnesota Univ., Minneapolis. Dept. of Chemical ineering; and Minnesota Univ., Minneapolis. pt. of Microbiology.
primary bibliographic entry see Field 05A.
1-07411

RIAL SURVEYS OF GREAT LAKES WATER MPERATURES, APRIL, 1966 to MARCH, 8,
partment of Transport, Toronto (Ontario). teorological Branch.
primary bibliographic entry see Field 05B.
1-07419

OTOGRAPHY AND OTHER REMOTE NSING OF WATER POLLUTION,
primary bibliographic entry see Field 05G.
1-07538

PRIME NEED: INSTRUMENTS FOR USE IN FIELD,
For primary bibliographic entry see Field 05A.
W71-07540

MEASURING THE HYDRAULIC POTENTIAL OF GROUNDWATER WITH THE HYDRAULIC POTENTIAL PROBE,
Grontmij N.V., Bilt (Netherlands).
B. Fokkens, and J. Weijenberg.
Journal of Hydrology, Vol 6, No 3, p 306-313, 1968. 8 p, 3 fig, 2 tab, 2 ref.

Descriptors: *Piezometers, *Groundwater movement, *Saturated soils, *Hydraulic conductivity, *Potentiometers, Methodology, Testing, Test procedures, Soil moisture meters, Manometers, Moisture tension.
Identifiers: *Hydraulic potential probe.

The 'potential probe' is a new instrument to measure hydraulic potentials in saturated soils, without disturbing the soil profile. The basic lag time of the apparatus is about 15 times shorter than that of normal one-inch-tube piezometers. A hollow steel needle with an outer diameter of 2 mm is connected with a manometer. This is the measuring needle which is closed at the lower end and provided with an opening one cm above the bottom. A mantle needle around the measuring needle can be moved over this opening. The manometer is made of a plastic laboratory tube with an inner diameter of 2 mm. This manometer can be closed at the upper end with a clip. The manometer is fitted on a lath which is clenched to a rod. This rod is pressed into the soil. The length of the measuring needle and the height of the manometer are 100 cm. The operation of the instrument is explained, and the data obtained are given. (Woodard-USGS)
W71-07630

DETERMINING WATER DISCHARGE BY ELECTROLYSIS WITHOUT FIELD CALIBRATION OF ELECTRODES (OPREDELENIYE RASKHODOV VODY ELEKTROLITICHESKIM SPOSOBOM BEZ POLEVOY TARIROVKI ELEKTRODOV),
For primary bibliographic entry see Field 02E.
W71-07658

7C. Evaluation, Processing and Publication

OPSET: PROGRAM FOR COMPUTERIZED SELECTION OF WATERSHED PARAMETER VALUES FOR THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07061

THE STANFORD WATERSHED MODEL: THE CORRELATION OF PARAMETER VALUES SELECTED BY A COMPUTERIZED PROCEDURE WITH MEASURABLE PHYSICAL CHARACTERISTICS OF THE WATERSHED,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07062

AN EVALUATION OF RELATIONSHIPS BETWEEN STREAMFLOW PATTERNS AND WATERSHED CHARACTERISTICS THROUGH THE USE OF OPSET: A SELF CALIBRATING VERSION OF THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07063

CARBON BUDGET AND TOTAL PRODUCTIVITY OF AN ESTUARINE OXIDATION POND RECEIVING SECONDARY SEWAGE EFFLUENT,
Institute for Environmental Health Studies, Morehead City, N.C.
For primary bibliographic entry see Field 05D.
W71-07092

SERIAL CORRELATION IN ANNUAL STREAM RUNOFF,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W71-07151

ANALYSIS AND EVALUATION OF PUMPING TEST DATA,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands); and Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02F.
W71-07166

WATER RELATED LAND USE IN THE WEBER RIVER DRAINAGE AREA,
Utah Dept. of Natural Resources. Div. of Water Rights.
For primary bibliographic entry see Field 04A.
W71-07167

CHARACTERIZATION OF WATER TABLES IN OREGON SOILS WITH REFERENCE TO TRAFFICABILITY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 02F.
W71-07173

URBAN HYDROLOGY, HOUSTON METROPOLITAN AREA, TEXAS - 1968,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 04C.
W71-07184

CHARACTERISTICS OF NEW YORK LAKES: PART 1A--GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY COUNTIES,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02H.
W71-07185

CHARACTERISTICS OF NEW YORK LAKES: PART 1B--GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY DRAINAGE BASINS,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02H.
W71-07186

AN APPROACH TO THE SELECTION OF A STREAMFLOW BASE PERIOD,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 02E.
W71-07188

DEVELOPMENT OF A STATEWIDE SYSTEM FOR COMPUTER PROCESSING OF HYDROGEOLOGICAL DATA,
Montana Bureau of Mines and Geology, Butte.
M. K. Botz.
Available from Montana Bureau of Mines and Geology 203-B Main Hall, Montana College of Mineral Science and Technology, Butte, Montana 59701. Montana Bureau of Mines and Geology Special Publication 49, 1970. 35 p, 3 fig, 2 tab, 25 ref. OWRR Project A-014-MONT (1).

Descriptors: *Montana, *Data processing, *Data storage and retrieval, *Hydrologic data, Hydrogeology, Water quality, Computer programs,

Digital computers, Planning, Water management (Applied).
Identifiers: *Hydrogeological data processing.

Numerous computer-oriented data-processing systems used to store, retrieve, and manipulate hydrogeological data are reviewed for their suitability for use in Montana. The US Geological Survey and the Canadian government have developed nationwide groundwater data-processing systems. The Federal Water Pollution Control Administration STORET system, systems used by the oil industry, and systems used in other states also may be of use in the development of a statewide groundwater data-processing system. Of the available processing systems, the US Geological Survey system is the most nearly complete and most useful for statewide use, but even this system is too limited in scope and flexibility. Planning and development of a comprehensive statewide hydrogeological data-processing system requires a computer facility, considerable funds, and skilled personnel. (Knapp-USGS)
W71-07239

GAZETTEER OF LOUISIANA LAKES AND RESERVOIRS,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02H.
W71-07247

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR DEEP CREEK, COLORADO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex.
H. R. Hejl, Jr.
Geological Survey Data Report, Feb 1971. 73 p, 2 fig, 3 tab.

Descriptors: *Rainfall-runoff relationships, *Streamflow, *Hydrologic data, *Colorado River basin, *Texas, Data collections, Flood control, Control structures, Stream gages, Flow characteristics, Gaging stations, Hydrographs, Surface waters, Mass curves.
Identifiers: *Deep Creek (Tex), Water budget.

This report contains the rainfall, runoff, and storage data collected during the 1969 water year (Oct. 1968-Sept. 1969) for the 43.9-square-mile area above the stream-gaging station Deep Creek near Mercury, Texas, and the 8.31-square-mile area above the stream-gaging station Dry Prong Deep Creek near Mercury, Texas. Six floodwater-retarding structures have been completed in the watershed. Five of these structures are upstream from the stream-gaging station Deep Creek near Mercury. They have a combined capacity of 5,600 acre-feet and regulate floodflow from 19.9 square miles (45%) of the drainage area above the stream-gaging station. The other structure is above the stream-gaging station Dry Prong Deep Creek near Mercury. It has a floodwater-retarding capacity of 1,370 acre-feet and regulates floodflow from 5.41 square miles, or approximately 65% of the drainage area above the stream-gaging station. The weighted-mean rainfall over the Deep Creek area was 30.79 inches and over the Dry Prong Deep Creek area was 30.26 inches. The ratio of rainfall to runoff ranged from 3.9 to 5.7% for the stations with continuous recording gages. (Woodard-USGS)
W71-07251

CALCULATION OF MEAN AREAL DEPTH OF PRECIPITATION,
Tennessee Univ., Knoxville. Dept. of Engineering Mechanics.
For primary bibliographic entry see Field 02B.
W71-07270

SUMMARY AND EVALUATION OF METHODS FOR DETECTING HYDROLOGIC CHANGES,
Agricultural Research Service, Athens, Ga. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02A.
W71-07271

DIGITAL COMPUTER SOLUTIONS OF GROUNDWATER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-07273

INITIAL REPORTS OF THE DEEP SEA DRILLING PROJECT, VOL. 6--HONOLULU, HAWAII TO APRA, GUAM, JUNE-AUGUST, 1969.
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02J.
W71-07287

GROUNDWATER RESOURCES OF ARANSAS COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02F.
W71-07292

CHARACTERISTICS OF NEW YORK LAKES: PART 1 - GAZETTEER OF LAKES, PONDS, AND RESERVOIRS,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 02H.
W71-07297

SELECTED HYDROLOGIC DATA, CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Salt Lake City, Utah.
L. J. McGreevy, and L. J. Bjorklund.
Utah Department of Natural Resources Basic - Data Release No 21, 1970. 51 p, 1 fig, 5 tab, 15 ref, 1 plate.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Utah, *Idaho, Data collections, Water level fluctuations, Aquifers, Water yield, Specific capacity, Water utilization, Depth, Chemical analysis, Aquifer characteristics, Hydrogeology, Water quality.
Identifiers: *Cache Valley (Utah and Idaho), *Groundwater basic data.

Selected basic data of the groundwater resources of Cache Valley, Utah and Idaho collected since 1935 are presented. The tables of data include well and spring records, water levels, logs of wells, water temperature, and chemical analyses of water samples. (Woodard-USGS)
W71-07303

WATER RESOURCE OBSERVATORY WIND DATA, WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie. Water Resources Research Inst.
Verne E. Smith.
Water Resources Series No 21. 182 p, 20 tab, 1 fig, 1 computer program. OWRR Proj No A-001-WYO (36).

Descriptors: *Climatic data, *Winds, *Data processing, *Anemometers, *Evaporation, Wyoming, Computer programs, Hydrologic cycle, Ecosystems, Instrumentation, Meteorological data, Model studies, Watershed management, Biogeography, Water year.
Identifiers: Snowy Range Water Resource Observatory, Wyoming Water Resources Operations Study.

Wyoming wind data, for the Snowy Range Water Resource Observatory, reduced from recording anemometer charts and from readings of totalizing anemometers are tabulated. Card formats and FORTRAN FOUR computer program are presented. This report is part of the investigation of bio-physical relations in the hydrologic cycle, under the Water Resources Operations Study. This data will be used to develop a hydrologic model of a mountain watershed ecosystem. Data is provided from October 1965 to September 1969. There ar 17 stations, 14 of which are totalized, and 3 o which are recorded. There are 20 tables, 1 instru mentation location map, 2 punch card formats an 1 FORTRAN FOUR program of 715 steps. (Pop kin-Arizona)
W71-07306

A COMPUTER BASED FLORISTIC ANALYSI OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. o Biology.
For primary bibliographic entry see Field 02L.
W71-07337

THE ESTUARINE VERSION OF THE COL HEAT DIGITAL SIMULATION MODEL,
Battelle Memorial Inst., Richland, Wash. Pacifi Northwest Labs.
For primary bibliographic entry see Field 05B.
W71-07428

HYDROGRAPHIC OBSERVATIONS ON TH RED SEA BRINES INDICATE A MARKED IN CREASE IN TEMPERATURE,
Woods Hole Oceanographic Institution, Mass.
P. G. Brewer, T. R. S. Wilson, J. W. Murray, R. G. Munns, and C. D. Densmore.
Nature, Vol 231, No 5297, p 37-38, May 7, 1971. p, 1 fig, 1 tab, 13 ref.

Descriptors: *Sea water, *Water temperatur *Water chemistry, *Brines, *Data collection Ships, Analytical techniques, Salinity, Iron, Ma ganese.
Identifiers: *Red Sea, Atlantis II.

The bathymetric and hydrographic data from th expedition of the R/V Chain during Novemb 1966 revealed three deeps in the Red Sea all co taining hot brine. During February 1971, R/ Chain revisited the brine area. The most unusu observation is that the temperature of the Atlan II brine has risen 2.7 deg C from 56.5 deg C to 59 deg C in the 51 months since the last published o servation. For the 1971 cruise, special high ran protected thermometers were used, and it is es mated that these observations were accurate about 0.05 deg C. The interface between the deg C brine and the intermediate brine seems have risen by about 6 m since 1966, giving an crease in volume of this brine of about 12%. No s nificant change was detected in the salinity of t deep Atlantis II brine. Observed increase in d solved iron and manganese indicates that over t period of observation, the rate of input of these e ments in the reduced form has greatly exceeded t rate of deposition of the oxidized form. (Wooda USGS)
W71-07604

LINEARIZING WEIGHT FACTORS FO LEAST-SQUARES FITTING,
Toronto Univ. (Ontario). Dept. of Mechanical E gineering.
Llewellyn E. Jones.
ASCE Proceedings, Journal of the Hydraulics Di sion, Vol 97, No HY 5, Paper 8089, p 665-67 May 1971. 13 p, 2 fig, 5 tab, 12 ref, append.

Descriptors: *Data processing, *Statistics, *Le squares method, *Statistical methods, Correlati analysis, Estimating, Quality control, Systems an ysis, Operations research.
Identifiers: *Curve fitting, *Experimental design.

Comprehensive relationships are given for le squares fitting of linear functions, corresponding various parametric conditions, but limited to fa bility in either abscissa or ordinate but not in bo For a nonlinear function linearized by suita change of variable (s), the given least-squares re tionships may be used validly if the weights are propriately altered. The necessary linearizi weight factors are derived and verified in numeri examples. (Knapp-USGS)

1-07614

NAMIC PROGRAMMING FOR CONJUNC-VE WATER USE,
nnsylvania State Univ., University Park. Dept. of il Engineering; and California Univ., Davis. pt. of Water Science and Civil Engineering.
primary bibliographic entry see Field 04B.
1-07616

ALUATION OF THE STREAMFLOW DATA OGRAM IN COLORADO,
ological Survey, Denver, Colo.
primary bibliographic entry see Field 02E.
1-07634

DROLOGIC FACTORS AFFECTING THE ILIZATION OF LAND FOR SANITARY NDFILLS IN NORTHERN HILLSBOROUGH UNTY, FLORIDA,
ological Survey, Tampa, Fla.
eph W. Stewart, and Robert V. Hanan.
rida Bureau of Geology Map Series No 39, 70. 1 Sheet, Text, 5 fig, 8 ref.

scriptors: *Landfills, *Solid wastes, *Water pol-on sources, *Florida, Hydrogeology, Land use, anization, Water quality, Surface waters, undwater, Topography, Soils, Drainage, Geolo- Aquifers, Aquifer characteristics, Sinks, undwater movement, Potentiometric level, nning, Springs, Artesian wells.
ntifiers: *Landfills (Northern Hillsborough unty, Fla).

s map report presents an overall picture of the thern part of Hillsborough County, Florida, ch should be useful in selecting prospective dfill sites. Included are a number of geologic and rologic factors, as well as other existing fea-es, which should be considered in selecting sites landfill operations. The criteria listed should vide a basis for establishing guidelines to aid se responsible for planning future solid-waste s in the county and should be useful in other as of Florida that have similar hydrogeologic ditions. Illustrations include Generalized sec-ns showing geology; Hydrologic map showing inage, thickness of undifferentiated sand and , areas of artesian flow, areas of sinkholes, loca-n of public water supplies, and location of sanita-andfill sites; Generalized soil permeability map; Potentiometric surface and water table during period, November 7-9, 1967. (Woodard-GS)
1-07638

DROLOGIC SETTING OF DEER POINT KE NEAR PANAMA CITY, FLORIDA,
ological Survey, Tallahassee, Fla.
H. Hughes.
rida Bureau of Geology Map Series No 38, 70. 1 Sheet, Text, 5 fig, 1 map, 2 tab, 11 ref.

scriptors: *Hydrologic data, *Lakes, *Florida, ter quality, Inflow, Water levels, Rainfall, Air perature, Water temperature, Water resources, mical analysis, Water utilization, Evaluation, face waters, Surface-groundwater relationships, a collections, Water quality, Water supply.
ntifiers: *Deer Point Lake (Panama City, Fla), drologic Atlas.

er Point Lake was formed in 1961 by construc- of a low-head causeway dam across the thern part of North Bay at Deer Point about 8 es north of Panama City, Fla. The lake provides mple water supply for the continued economic wth of the Panama City area and adds to the reational facilities available for tourists and re-nts of that area. During 1968 the total water ndrawn from Deer Point Lake for municipal and ustrial use averaged about 40 mgd, or slightly than 15% of the streamflow that entered th during the 1968 drought. Chemical analyses of er taken from the lake the day before the dam was closed showed that the concentrations of chloride averaged about 11,000 mg/liter. Because of mixing of the saline lake water with the large throughflow of fresh water, the average concentration of chloride was reduced to less than 400 mg/liter within 3 months after dam closure and to less than 40 mg/liter within a year. This one sheet atlas contains tables and illustrations of data concerning water quality, streamflow entering the lake, lake water levels, rainfall, air temperature, and water temperature. (Woodard-USGS)
W71-07639

HYDROLOGIC STUDIES AND COMPUTATIONS (GIDROLOGICHESKIYE ISSLEDOVANIYA I RASCHETY),
For primary bibliographic entry see Field 02E.
W71-07647

USE OF THE 'PROMIN' COMPUTER FOR CALCULATING THE EFFECT OF A RIVER BASIN RESERVOIR ON MAXIMUM WATER DISCHARGES (RUSSIAN: OPYT PRIMENENIYA EVM 'PROMIN DLYA RASCHETA VLIYANIYA VODOKHRANILISHCHA V BASSEYNE REKI NA MAKSIMAL 'NYYE RASKHODY VODY),
For primary bibliographic entry see Field 02E.
W71-07648

CALCULATIONS OF HIGH WATER DISCHARGES ON THE 'PROMIN' COMPUTER (RASCHETY RASHHODOV POLOVOD'YA NA EVM 'PROMIN'),
For primary bibliographic entry see Field 02E.
W71-07649

TYPICAL CHARTS OF UNIT INFLOW OF HIGH WATERS FROM LOWLAND RIVERS OF SOUTHWESTERN EUROPEAN USSR (KHARAKTERNYYE GRAFIKI ELEMENTARNOGO PRITOKA VYSOKIKH POLOVIDIY RAVNINNYKH REK YUGO-ZAPADA YEVROPEYSKOY TERRITORII SSSR),
For primary bibliographic entry see Field 02E.
W71-07650

08. ENGINEERING WORKS

8A. Structures

WATER WAVES GENERATED BY LANDSLIDES,
Asian Inst. of Tech., Bangkok (Thailand).
E. Noda.
Proceedings American Society of Civil Engineers, Journal of the Waterways Harbors and Coastal Engineering Division, Vol 96, No WW4, p 835-855, Nov 1970. 21 p, 12 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Waves (Water), *Landslides, Dam design, Reservoirs, Wave height, Coastal engineering, Earthquakes, Tsunamis, Bank stability, Two-dimensional, Analytical techniques, Solutions, Equations, Theory, *Wave generation, Comparative studies, Experimental data, Numerical analysis, Shores, Foreign research.
Identifiers: Empirical methods, Thailand.

The problem of water waves generated by landslides along coastlines or in enclosed bodies of water is of great practical interest to design engineers when geological factors predict the possibility of a landslide. Two distinct types of landslide are considered--vertical and horizontal. The vertical landslide is modeled by a 2-dimensional box falling vertically. The horizontal landslide is modeled by a 2-dimensional wall that moves into the fluid domain. Theoretical solutions are obtained, assuming that the geometric and dynamic parameters of the problem are known. Graphs are presented for motion with constant velocity. Results of experiments to verify the vertical landslide theory compare favorably in the region where linearized theory is valid. An approximate method is developed to find the amplitude of the largest wave in the nonlinear region by utilizing the solutions obtained from linear theory for vertical landslides. The approximate method is applied to the Lituya Bay, Alaska landslide of July 9, 1958, to estimate the largest wave. (USBR)
W71-07070

LOCK AND DAM NO. 13, ARKANSAS RIVER NAVIGATION PROJECT; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and L. J. Shows.
Sponsored by US Army Engineer District, Little Rock. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-8, July 1970. 19 p, 6 tab, 25 pl.

Descriptors: *Locks, *Hydraulic models, Dams, Navigable rivers, Dikes.
Identifiers: *Navigation dams, *Lock and Dam No 13 (Arkansas River Project), Arkansas River Navigation Project, Navigation conditions, Revetments.

Lock and Dam No. 13 is proposed for construction on the Arkansas River about 7 miles downstream of Van Buren, Ark. Model investigation was concerned with the study of navigation conditions in the approaches to the lock to determine the effects of the proposed regulating structures on channel development in the reaches upstream and downstream of the structure and with the development of measures required to overcome or minimize the effects of any adverse conditions. An undistorted, semifixed-bed, 1:120-scale model reproduced about 7.4 miles of the Arkansas River and additional bank area. The results of the investigation indicated the need for modifications in the regulating structures to improve navigation conditions through the reaches upstream and downstream of the lock. Conditions in the bend and in the crossing downstream can be improved by raising the elevation of the dikes and revetment farther downstream to head of crossing. Construction of a wing dike would reduce frequency of maintenance dredging. (Franco-WES)
W71-07171

CONSIDERED LAKE ERIE-LAKE ONTARIO WATERWAY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 06B.
W71-07172

LOCK AND DAM NO. 14, ARKANSAS RIVER NAVIGATION PROJECT; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and L. J. Shows.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-71-1, Feb 1971. 33 p, 6 tab, 5 photo, 31 pl.

Descriptors: *Locks, *Hydraulic models, Dams, Navigable rivers.
Identifiers: *Navigation dams, *Lock and Dam No 14 (Arkansas River Project), *Arkansas River Navigation Project, *Navigation conditions.

Project will provide a navigable pool extending upstream about 20 miles to the Robert S. Kerr Dam. The investigation, concerned with the study of navigation conditions in the approaches to the lock with the proposed design and with the development of modifications required to produce adequate channel depths and to overcome or minimize the effects of any adverse navigation conditions, was

conducted on an undistorted, 1:120-scale, semifixed-bed model, reproducing about 3.4 miles of the Arkansas River and adjacent overbank area. Results indicate that: because of location of lock with respect to the bend upstream, navigation conditions for downbound tows approaching lock would tend to be difficult and hazardous; satisfactory navigation conditions can be developed by modification of existing structures and realignment of right bank upstream of the lock; because of the training structures required to develop adequate channel depths and currents satisfactory for navigation, velocities in reaches just upstream and downstream of dam will tend to be high during high flows; velocity of currents affecting navigation in lower approach can be reduced by excavation of channel downstream of the spillway; and shoaling in the lower lock approach will be a problem. (Franco-WES)
W71-07175

CALCASIEU SALTWATER BARRIER, PROTOTYPE SECTOR GATE TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. F. Bastian.
Sponsored by US Army Engineer District, New Orleans. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-71-4, Feb 1971. 14 p, 1 tab, 10 pl.

Descriptors: *Barriers, *Prototype tests, *Gates, *Saline water intrusion.
Identifiers: *Calcasieu Saltwater Barrier, *Sector gates, Navigation structures.

Prototype tests were conducted on the sector gate at the Calcasieu Saltwater Barrier navigation structure in March 1970. The controlled variables were the rate of gate openings and the differential reverse head. Prototype tests showed that the hydrodynamic and friction forces were much greater than anticipated in the design. The prototype data agreed reasonably well with the model data of a similar gate. (Bastian-WES)
W71-07178

DEVELOPMENT OF NAVIGATION AT LOCK AND DAM NO. 17, ARKANSAS RIVER PROJECT; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, J. E. Glover, and B. K. Melton.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-12, Sept 1970. 21 p, 19 pl.

Descriptors: *Locks, *Hydraulic models, Dams, Navigable rivers, Gates.
Identifiers: *Navigation dams, *Lock and Dam No 17 (Arkansas River Project), *Arkansas River Navigation Project, Navigation conditions, Verdigris River, Tainter gates.

Lock and Dam No. 17 will comprise a nonnavigable gated dam with three 61-ft-wide by 27-ft-high tainter gates 9.8 miles above the confluence of the Arkansas and Verdigris Rivers, and a 110- by 600-ft lock located about 0.6 mile east in an excavated, slack-water navigation canal. Two 1:120-scale fixed-bed models, reproducing about 1.8 mi of upper and about 2.1 mi of lower reaches of the river channel and the slack-water navigation canal, were used to study navigation conditions at the upstream and downstream entrances to the navigation canal, and to determine flow conditions that could be expected near the entrances to the slack-water canal and through existing and proposed bridges and the modifications required to produce satisfactory navigation conditions through the reach. Results of the investigations are given. (Spivey-WES)
W71-07181

THE SOUTH LAKE TAHOE WATER RECLAMATION PROJECT,
Hill (Clair A.) and Associates, Redding, Calif.
For primary bibliographic entry see Field 05D.
W71-07193

ENGINEERING A HOLE IN THE GROUND.
Hawthorne, Inc., Houston, Tex.

Bulletin No S, EH-656, 756, 856, 956 and 1056, 1964. 24 p, 33 fig.

Descriptors: *Drilling, *Water wells, Drilling equipment, Drilling fluids, Wells, Pump, Mud, Gravels.
Identifiers: *Shot-hole drilling, Hole size, Bitsize, Annulus area, Up-hole velocity, Hole fluid requirements, Bit penetration vs. rotary speed, Jet drilling, Horsepower requirements, Drilling mud functions, Lost circulation, Gravel drilling, Crooked holes, Reaming stabilizer.

The characteristic problems related to drilling relatively small diameter holes are generally quite similar. The basic objective is fundamentally economic - to produce the maximum hole at minimum competitive cost for equipment and labor, and to provide a reasonable footage price to the customer and reasonable footage profit to the contractor. The booklet covers the general characteristics of shot hole drilling problems in some depth with abundant figures and sparse references. (Campbell-NWWA)
W71-07203

WELL AND WELL FIELDS IN TEXAS GULF COAST SEDIMENTS,
Guyton and Associates, Austin, Tex.
M. L. Klug, and W. F. Guyton.
Water Well Journal, Vol 14, No 1, p 14, p 27-30, Jan 1960.

Descriptors: *Water wells, *Well fields, Aquifer characteristics, Specific capacity, Observation wells, Drilling, Logging (Recording).
Identifiers: *Large capacity industrial wells, *Gulf coast, Pump tests, Well interference, Fresh water sands, Salt water sands.

Geologic and hydraulic characteristics of the aquifers in the vicinity where a groundwater supply is to be developed must be carefully evaluated to obtain the most economical and efficient wells and well field. Although this article deals primarily with wells in the Gulf Coast sediments, much of it is applicable to other parts of the United States. The Texas Gulf Coast sediments are comprised of alternating layers of sand and clay to a depth of several thousand feet. Thicknesses of individual layers range from a few feet to several hundred feet. In some areas there is considerable thickening and thinning of individual layers and many times a layer will pinch out completely in a short distance. Character and thickness of water-bearing sands vary both areally and with depth. The formations have a regional dip toward the coast. Dips may range from a few feet per mile in the outcrop areas to more than 100 feet per mile downdip. Local and sometimes widespread structures create variations from this regional pattern. The maximum depth at which fresh water occurs in the Gulf Coast sands varies from zero to more than 5,000 feet. In some areas brackish water may be encountered throughout all the sediments, while in other areas fresh water may be encountered in all sands to depths of more than 3,000 feet. In many places fresh water sands are encountered below sands which contain brackish water. Sands which contain fresh water in one area may contain brackish water only a short distance down-dip. (Campbell-NWWA)
W71-07204

WATER WELL CONSTRUCTION,
Louisiana House of Representatives, Baton Rouge.
W. P. Arceneaux.
Proceedings of the 26th Annual Short Course f Superintendents and Operators of Wat Sewerage, and Industrial Waste Disposal Syste Div. Engineering Research Bull, No 75, p 28-3 1964.

Descriptors: *Water wells, *Drilling, Scree Equipment, Corrosion, Casing.
Identifiers: *Test hole, Screen slection, Well gra treatment, Naturally developed wells, Water w maintenance.

Written in laymen's terms, this report summari the more important aspects of water well constr tion. Test holes are recommended for compl aquifer evaluations before construction of a p manent well. Formation characteristics and wa chemistry can be established in advance to ass proper well design. Screen selection can be ma more appropriately. The report considers the va of gravel treatment, pump selection and well ma tenance with the well owner in mind. (Campb NWWA)
W71-07206

JOHNSON SCREENS.
Universal Oil Products, St. Paul, Minn. John Div.

Catalog 169. St. Paul, Minnesota, UOP Johns 1969. 35 p.

Descriptors: *Well screens, *Equipment, *Wa wells, Well points, Groundwater, Wells, Dewa ing, Drilling fluid, Mud.
Identifiers: Self-jetting well points, Intake scre Slot openings, Gravel pack wells, Formation an sis, Grain-size classification, Filter elements, derdrains, Well screen installation, Gravel pack techniques, Water well development, Mechan surging, Surging with air, High-velocity jett Water well cleaning chemicals.

This catalog briefly summarizes the use of scre for water well installations. A well screen is on the most important parts of a water well becau serves as the water intake portion of the well. well screen must allow sand free water to flow the well in ample quantity and with minimum of head to supply the pump at full capacity. screen affects the following factors: (1) capa (2) drawdown and pumping lift, (3) productio sand-free water and (4) maintenance cost and of well. The catalog also discusses well screen cessories and application engineering approac (Campbell-NWWA)
W71-07207

HYDRAULICS OF RIVER CHANNEL C SURE,
Moskovskii Energeticheskii Institut (USSR).
S. V. Izbash, and Kh Yu. Khaldre.
Trans of Gidravlika Perekrytiya Rusel Rek, 1 Hartford Connecticut, Daniel Davey and C pany, Inc, 1970. 174 p, 45 ref.

Descriptors: *Civil engineering, *Hydraulic gineering, *Hydraulic structures, *Hydrauli dams, *Dam design, *Dam construction, Cha morphology, Streamflow, Hydroelectric pl Methodology, Mathematical studies, Equati Flow rates, Velocity, Stress, Construction ma als.
Identifiers: *USSR, *Channel closure hydraulic

The hydraulics of channel closure are discuss a textbook for civil engineers; the discussion cludes laboratory and field study data. Prac and economic aspects of the experience of cha closure gained by Russian engineers hydropower projects in the Soviet Union are a available to English speaking people. The main ics of discussion include: (1) Basic principles hydrologic analysis of channel contraction; hydraulic resistance of material tipped streams; (4) general characteristics of the diffe methods of river channel closure; (5) interacti water flow and rockfill; (6) turbulent see

ugh fill material; (7) some features of icated-unit fills; and (8) worked examples of ulations relating to river closure. (Woodard-S)
-07335

IPHYSIOLOGICAL LINKS IN THE OSYSTEM OF MARINE OVERGROWTHS
sian: Simfiziologicheskiye svyazi v oligomikst- biotsenoze morskogo obrastaniya),
demiya Nauk SSSR, Moscow. Institut Oke-ogii.
P. Turpayeva.
demiya Nauk SSSR Doklady, Vol 189, No 2, p 417, 1969. 3 p, 1 fig, 9 ref.

criptors: *Marine animals, *Industrial plants, osystems, Crustaceans, Crabs, Mollusks, iation, Biomass, Aquatic animals, Trophic .
tifiers: *Azov Sea, Polyps.

raulic structures of the Zhdanov Metallurgical t on the Azov Sea have been fouled by an as-blage of marine life. In 1968 the biocenosis isted of 4 species--the polyp Perigonimus as Kinne, the crustacean Balanus improvisus vin, the crab Rhithropanopeus harrisii Goul, the mollusk Tenellia adspersa (Nordman). Of four, the polyp was predominant and had the est number of links with the other three, creat-or them a habitat. The direct and indirect links luding trophic) in the biocenosis are schemati- shown. The degree to which these links in-nced the number of populations of interacting ies varied as a function of the season, ological and biologic conditions and age of the ulations. (Josefson-USGS)
-07336

OLYSIS GAS CHROMATOGRAPHIC TERMINATION OF ARYLSULFONIC ACIDS D SALTS,
sachusetts Univ., Amherst.
ey Siggia, and Lee R. Whitlock.
lytical Chemistry, Vol 42, No 14, p 1719-1724, 1970. 3 fig, 5 tab.

criptors: *Gas chromatography, *Water analy-Sulfonates, Salts, Analytical techniques.
tifiers: *Sulfonic acids, Chemical inter-nces.

quantitative determination of arylsulfonic s and their salts is described using pyrolysis gas matography to measure either sulfur dioxide the parent hydrocarbon. Sulfur dioxide is vered quantitatively; the parent hydrocarbon is vered at the 50 percent level or less. A linear onse for both is obtained for a range of sample hts from 0.2 to 1000 mg. Because of the sen-ity of gas chromatography, it is useful for direct ysis of aqueous solutions down to the parts-per-on concentration of sulfonate. The presence of um sulfonate does not interfere. By making ple solutions basic, the interference from sul- acid in sulfur dioxide measurement is inated. Addition of carbohydrozide to the lysis sample will significantly increase rocarbon recovery; for example, the recovery enzene from benzenesulfonic acid is increased 8 percent. Best results were obtained when the rozide was used alone without added diluent. rtland-Battelle)
-07401

TERMINING SEEPAGE CHARAC-RISTICS OF MILL-TAILINGS DAM BY THE ITE-ELEMENT METHOD,
eau of Mines, Washington, D.C.
primary bibliographic entry see Field 08B.
-07455

E SAN FERNANDO, CALIFORNIA, RTHQUAKE OF FEBRUARY 9, 1971.
logical Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07659

DAMAGE TO CONSTRUCTED WORKS, ASSOCIATED WITH SOIL MOVEMENTS AND FOUNDATION FAILURES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07662

DAMAGE TO WATER SUPPLY SYSTEMS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 08D.
W71-07663

DRILLER'S HANDBOOK NO. 1,
Petroleum Publishing Co., Tulsa, Okla.
J. O. Scott, and E. McGhee.
Oil and Gas Journal Technical Manual Reprint, Fifth Printing, 1964. 81 p.

Descriptors: *Drilling, *Drilling equipment, Oil industry, Oil wells, Rotary drilling, Casings, Pumps.
Identifiers: *Drilling line, *Drill string, *Mud pump, Drill collars, Tool joints, Drill pipe, Pump sizes, Pump maintenance, Pump operation, Pump installation.

Of interest to the novice experienced driller and drilling engineer, this handbook covers (1) design, handling and maintenance of drilling line, (2) design, handling, and maintenance of drill pipe, drill collars and tool joints, (3) installation, operation and maintenance of mud pumps, and (4) problems of high-pressure drilling. Written entirely in driller's language, the handbook is very useful for solving practical problems on the job with large oil rigs or smaller mineral-water well rigs. (Campbell-NWWA)
W71-07683

DRILLER'S HANDBOOK NO. 2,
Petroleum Publishing Co., Tulsa, Okla.
E. McGhee, P. L. Moore, G. R. Gray, J. W. Speer, and B. Q. Green.
Oil and Gas Journal Technical Manual Reprint, Fourth Printing, 1964. 70 p.

Descriptors: *Drilling, *Drilling equipment, Oil industry, Oil wells, Rotary drilling, Drilling fluids, Casings, Pumps.
Identifiers: Draw works, Compounding transmission, Chains, Drum brakes, Auxiliary brakes, Clutches, V-Belts, Drilling rate factors, Hydrostatic pressure, Bit weight, Rotary speed, Drilling-fluid properties, Hydraulic horsepower, Lost circulation materials, Economics of drilling, Contract bidding.

Of interest to the novice and experienced driller and the drilling engineer, Handbook No. 2 serves as an excellent companion to Handbook No. 1 and covers (1) the draw works and compounding transmission, (2) five factors that affect drilling rate, (3) chemical in drilling mud, (4) how to get the most hole for your money and (5) which lost-circulation materials to use and how to use them. There are three major steps which assure profit in contract drilling (1) intelligent bidding (2) drilling efficiency and (3) keeping costs low. Bidding and making hole depend on the geographical area, but keeping costs down carry through in every area. It starts with getting the proper equipment, continues and ends with maintaining that equipment properly. Written entirely in driller's language, the handbook is very useful for understanding the operation of many kinds of drilling equipment and for understanding the factors involved in more efficient drilling. The handbook is applicable to oil, water and mineral drilling operations. (Campbell-NWWA)
W71-07684

8B. Hydraulics

GATED SPILLWAY FOR RAYSTOWN RESERVOIR, JUNIATA RIVER, PENNSYLVANIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. R. Oswalt, and T. E. Murphy.
Sponsored by US Army Engineer District, Baltimore. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-15, Dec 1970. 9 p, 1 tab, 4 photo.

Descriptors: *Spillways, *Spillway gates, *Hydraulic models, Open channel flow.
Identifiers: *Raystown Reservoir, Juniata River, Flip buckets.

Model investigation of the two-bay spillway for Raystown Dam was concerned with flow conditions in the spillway approach, over the weir, and in the chute; performance of the flip bucket at the lower end of the chute; and the adequacy of riprap on the left bank across the Juniata River from the spillway discharge channel. Of primary concern were severe surges at the spillway gates that had been observed in models of other projects where operating conditions were similar to those at Raystown spillway. Tests were conducted in a 1:60-scale model that reproduced 1000 ft of upstream approach channel, the entire spillway including weir, chute, and flip bucket, and about 1000 ft of the downstream channel. Surges at the spillway gates did not occur under any anticipated operating conditions. Except for a minor deficiency in the height of a portion of the chute walls, all elements of the structure performed essentially as planned by the designers. (Oswalt-WES)
W71-07168

SPILLWAY FOR OAKLEY DAM, SANGAMON, ILLINOIS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. S. Melsheimer.
Sponsored by US Army Engineer District, Chicago. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-13, Nov 1970. 10 p, 15 photo, 18 pl.

Descriptors: *Spillways, *Hydraulic models, *Stilling basins, Open channel flow, Riprap.
Identifiers: *Oakley Dam, Sangamon River.

Tests on spillway were conducted on a 1:60-scale model to determine flow conditions in approach and exit channels and the performance of various elements of the structure. Particular emphasis was placed on the selection of a stilling basin that would perform satisfactorily with a Froude number (3.0 plus or minus) of entering flow insufficient for ideal performance of a hydraulic-jump type basin. Approach flow conditions were generally satisfactory; no modifications to abutments were required. Tests also indicated that stone size selected for wave protection along the upstream embankment would be sufficiently large. The capacity of spillway was greater than computed; this is attributed to less than anticipated losses at the abutments and the absence of submergence effects of spillway flow. Basin selected for prototype construction was 70 ft shorter than the original design, utilized a 100-ft-long apron with 6-ft-high chute blocks, one row of 6-ft-high baffle piers, and 3.5-ft-high end sill. Observations also indicated that the roadway and bridge immediately downstream of the structure do not appear to be endangered at flows up to 25,000 cfs, nor do they impair stilling basin performance. Riprap protection is required on the embankments and in the exit below the structure. (Spivey-WES)
W71-07169

SPILLWAY FOR COPAN DAM, LITTLE CANEY RIVER, OKLAHOMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-9, July 1970. 13 p, 11 photo, 16 pl.

Descriptors: *Spillways, *Hydraulic models, *Stilling basins, Open channel flow.
Identifiers: *Copan Dam, Little Caney River.

Stilling basin for Copan Dam, which is expected to be subjected to unit discharges as large as 860 cfs, was studied on a 1:60-scale comprehensive model to confirm design and performance of proposed stilling basin and exit area. Flow conditions in approach area and over spillway were satisfactory. Original design stilling basin, which under design discharge conditions is subject to flow with a Froude number of 3, performed adequately. However, alternate designs were investigated and the model indicated that length of stilling basin could be reduced 20 ft without impairing hydraulic performance. Model tests were also conducted to investigate adequacy of proposed riprap for protection of exit area and feasibility of a retaining dike or levee which paralleled the center line of exit channel. Failure of both the exit channel protective stone and the levee occurred with design discharge conditions. However, the height of levee required to prevent overtopping and the magnitude and direction of currents along levee were determined in order that a stable levee could be provided, if desired. (Fletcher-WES)
W71-07170

SPILLWAY FOR KAW DAM, ARKANSAS RIVER, OKLAHOMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher, and J. L. Grace, Jr.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-14, Dec 1970. 15 p, 11 photo, 25 pl.

Descriptors: *Spillways, *Hydraulic models, Open channel flow, Stilling basin.
Identifiers: *Kaw Dam, Arkansas River.

Spillway for Kaw Dam, which is expected to be subjected to discharges as large as 616,200 cfs, was studied on a 1:100-scale comprehensive model to determine flow conditions in the approach and exit channels and the performance of various elements of the structure. Modifications to left abutment were recommended to provide a more economical design without inducing excessive turbulence, surging, and/or drawdown in gate bays adjacent to left abutment. Capacity of spillway as determined with the model was slightly less than computed. Modification of left abutment did not alter the capacity. Tests indicated that original design stilling basin performed satisfactorily. Tests also indicated that use of a dike to prevent return flow from the large expanse left of the exit channel and stilling basin would permit reducing height and length of the left training wall and prevent excessive scour along left portion of exit channel. The designs of the right stilling basin training wall and the right tailrace training wall also were developed with the model. (Fletcher-WES)
W71-07176

SALAMONIE DAM FLIP BUCKET PROTOTYPE TESTS, SALAMONIE RIVER, INDIANA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. F. Bastian.
Sponsored by US Army Engineer District, Louisville. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-71-1, Jan 1971. 7 p, 5 pl.

Descriptors: *Prototype tests, *Jets, *Energy dissipation, Open channel flow.
Identifiers: *Flip buckets, *Salamonie Dam.

Prototype tests were conducted at Salamonie Dam in December 1969 to measure the jet throw distance from the flip bucket for three different discharges and the velocity distribution 1 ft upstream from the ramp crest for these same discharges. The actual throw distances agree reasonably well with computed design values. (Bastian-WES)
W71-07177

SPILLWAY AND OUTLET WORKS, TOCKS ISLAND DAM, DELAWARE RIVER, PENNSYLVANIA, NEW JERSEY, AND NEW YORK; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. S. Melsheimer.
Sponsored by US Army Engineer District, Philadelphia. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-10, July 1970. 15 p, 27 photo, 25 pl.

Descriptors: *Spillways, *Outlet works, *Delaware River, *Hydraulic models, Open channel flow, *Surges, Stilling basins.
Identifiers: *Tocks Island Dam, *Spillway chute.

The spillway for Tocks Island Dam was studied on a 1:60-scale comprehensive model and a 1:64-scale spillway model to determine flow conditions in the approach and exit channels and the performance of various elements of the structure. Modifications to both abutments were required to correct unequal distribution of flow that caused considerable turbulence and drawdown in the spillway bays adjacent to the abutments. Expected capacity of spillway was not adversely affected by the turbulence at the abutments. The surging phenomenon observed in gate bays at the larger gate openings was eliminated by maintaining a minimum bay width not less than 1.2 times the controlled head on the spillway, or about 53.5 ft in the six-bay spillway. The original spillway chute was modified to achieve reduction in cost without sacrificing hydraulic performance. To provide acceptable basin action the original basin had to be lowered 10 ft in elevation. Recommended stilling basin utilized a 204-ft-long apron at el 271.5 surmounted by two rows of 12-ft-high baffle piers and an 8.5-ft-high end sill. Riprap protection is required along the downstream toe of right embankment. (Melsheimer-WES)
W71-07179

DESIGN FOR FLOOD CONTROL AND WAVE PROTECTION, CHAGRIN RIVER, EASTLAKE, OHIO; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. E. Chatham, Jr.
Sponsored by US Army Engineer District, Buffalo. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-11, Sept 1970. 18 p, 11 tab, 33 photo, 26 pl.

Descriptors: *Flood control, *Waves (Water), *Hydraulic models, Breakwaters, Lake Erie, *Shore protection.
Identifiers: *Chagrin River, *Eastlake (Ohio).

A 1:75-scale model of the lower 2000 ft of the Chagrin River and sufficient offshore area in Lake Erie to permit generation of the required test waves was used to investigate the arrangement and design of certain proposed improvements with respect to wave action and flood control. Proposed improvement plans consisted of (1) arrowhead breakwaters in Lake Erie at the mouth of the river, aggregating about 2360 ft in length; (2) realignment and enlargement of the river channel from Lake Erie through the city of Eastlake, with levees where required to supplement channel enlargement; (3) a spur channel and an access channel for navigation; (4) recreational facilities at the river mouth; and (5) the addition of beach fill and protective groins along the shoreline east of the east breakwater. A 60-ft-long wave machine and electrical wave height measuring and recording apparatus were utilized in model operation. Conclusions from tes results are given. (Chatham-WES)
W71-07180

SPILLWAY FOR ALUM CREEK DAM, ALUM CREEK, OHIO; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. A. Pickering.
Sponsored by US Army Engineer District, Huntington. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-4, Apr 1970. 11 p, 3 photo, 13 pl.

Descriptors: *Spillways, *Hydraulic models, Open channel flow, Stilling basins, Gates, Discharge coefficients.
Identifiers: *Alum Creek Dam, Tainter gates.

Tests were conducted on a 1:60-scale model of the Alum Creek Dam spillway to determine flow conditions in the spillway approach channel, discharge characteristics of the spillway, stilling basin performance, and flow conditions in the outlet channel. The spillway consisted of an ogee crest with three 34-ft-wide by 25-ft-high tainter gates, a spillway chute, and a hydraulic-jump type stilling basin. Flow conditions in the cured approach channel to the spillway were satisfactory for the expected discharges. The discharge capacity of the original design was slightly greater than expected. Discharge coefficients and pier and abutment contraction coefficients were determined from model data. The original design stilling basin did not perform satisfactorily. However, a satisfactory and more economical design was developed. Velocities of flow were measured in critical areas of the approach and outlet channels for use in design of riprap protection. (Pickering-WES)
W71-07182

A STUDY OF STORM-WATER INLET CAPACITIES,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
William A. Wintz, and Yung H. Kuo.
Available from the National Technical Information Service as PB-196 129, $3.00 in paper copy, $0.95 in microfiche. Louisiana Department of Highways, 1970. 96 p, 61 fig, 19 tab, 7 ref. DOT BPR 466-042.

Descriptors: *Intakes, *Drainage systems, *Drainage engineering, *Surface runoff, *Hydraulic models, *Road design, Model studies, Hydraulics, Hydraulic similitude, Hydraulic engineering, Drains, Highways, Runoff, Storm runoff, Louisiana.
Identifiers: *Storm water inlets, *Highway drainage, Inlet capacities.

Graphs and equations are presented for use by engineers in computing the capacities of four standard types of storm water inlets used by the Louisiana Department of Highways. Full-size model studies were made of the hydraulic characteristics of these inlets at Louisiana State University. The model, representing one lane of a highway with curb and inlet, was 12 feet wide and 72 feet long. It was completely adjustable to permit varying the longitudinal and cross slopes, for changing inlets and curbs, and for supplying either one-way or two-way flow. The water flow was controlled to produce uniform and steady flow conditions over a surface having a roughness coefficient (Manning 'n') of 0.01, approximating that of a concrete road-way. Experiments were conducted to determine the ratio of the total flow intercepted by each of the four standard inlets when used under different conditions simulating actual field installations. Two different curb types were used -- a roll-over curb and a barrier curb. The inlets were combination types consisting of a surface grate and a curb op-

Two graphs were developed for each set of
able parameters. By entering the graphs with
med values of flow and cross-slope, the ratio of
rcepted flow to total flow and the linear spread
water over the road width can be predicted.
ommendations are made on curb selection,
ss slope, and inlet types. Empirical flow formu-
re also presented. (Poertner)
1-07199

ME PRELIMINARY OBSERVATIONS ON ANSITION IN A PIPE,
hnion-Israel Inst. of Tech., Haifa. Dept. of
onautical Engineering.
'ygnanski.
ially supported by Boeing Scientific Research
s. Available from the National Technical Infor-
ion Service as N71-10473, $3.00 in paper copy,
5 in microfiche. Technion-Israel Institute of
hnology, Department of Aeronautical En-
ering TAE Report 108, Apr 1970. 36 p, 18 fig,
ef.

criptors: *Turbulent flow, *Transition flow,
e flow, Critical flow, Froude number, Turbu-
e, Closed conduit flow, Velocity, Reynolds
ber.

ventional and conditionally sampled hot-wire
surements were taken in a pipe at Reynolds
bers corresponding to the onset of turbulence.
laminar velocity profile is distorted in an ax-
metric fashion with increasing Re. At Re over
0 the increase of Re has no significant effect on
shape of the laminar velocity profile even when
ulent slugs appear. Some gross characteristics
rbulent slugs were examined; a typical slug is
metrical provided that it originates in the pipe
it is not triggered by an obstacle at the inlet.
rage measurements of turbulence within the
show that a turbulent slug behaves in much the
c way as the fully developed turbulent pipe
. (Knapp-USGS)
1-07242

**DRAULICS OF RIVER CHANNEL CLO-
E,**
kovskii Energeticheskii Institut (USSR).
primary bibliographic entry see Field 08A.
1-07335

**X DEVELOPMENT REGION IN SUB-
RGED JETS,**
ois Univ., Urbana. Dept. of Civil Engineering.
Hall C. Maxwell.
nal of the Engineering Mechanics Division,
ceedings of American Society of Civil En-
crs, Vol 96, No EM6, Proc Paper 7756, p
1-1079, Dec 1970. 9 fig, 2 tab, 16 ref.

criptors: *Temperature, *Tracers, *Turbu-
e, *Flow, Mass, Heat.
tifiers: *Submerged jets, *Flux distribution,
nentum.

tions are obtained for flux distribution close to
nerged turbulent jet outlets. All solutions use
lated probability functions or exponential
tions. A comparison is made with momentum
data for axisymmetric jets and a plane-symmet-
et in a coplanar flow, and agreement is shown
e good. A generalized Reichardt hypothesis is
loyed to obtain Gaussian distributions for the
of mass, heat and momentum and permits su-
osition of elementary solutions. The analysis is
ented for plane and axisymmetric flows. An ad-
nent to the origin of the data matches axial flux
with the mathematical model and defines a
ading coefficient, leading to a complete defini-
of the flux distribution. The solutions are in the
of a distorted chisquare distribution, and two
rted normal distributions. A simple solution
nd the potential core uses the axial distribu-
of flux to obtain the radial distribution directly.
analysis shows promise of providing
ghtforward solutions for free turbulent flows involving complex boundary conditions. (Upadhyaya-Vanderbilt)
W71-07436

DETERMINING SEEPAGE CHARACTERISTICS OF MILL-TAILINGS DAM BY THE FINITE-ELEMENT METHOD,
Bureau of Mines, Washington, D.C.
Charles Daniel Kealy, and Richard A. Busch.
Available from the National Technical Information Service as PB-197 027, $3.00 in paper copy, $0.95 in microfiche. Report of Investigations RI-7477, Jan 1970. 113 p, 34 fig, 2 tab, 52 ref.
Identifiers: *Seepage, Mathematical models, *Water pollution, Control, *Tailings, Earth dams, Computer programs, Embankments, Stress, Two dimensional flow, Soil mechanics, Finite element analysis, *Mill tailings disposal.

Finite-element, mathematical models that solve LaPlace's and Richard's equations numerically were used to locate the phreatic surface within tailings pond embankments and to define the subsurface flow of water from the pond. Both must be known to design structurally and environmentally safe tailings dams. The permeability distribution within and beneath the embankment, the fluid potential values upgradient and downgradient from the embankment, and the geometry and elevation of an approximately impermeable layer at some depth beneath the embankment were used as computer inputs in analyzing over a dozen finite-element models of tailings dams varying structurally from simple to complex. Results predicted with the finite-element model were confirmed with measurements in a laboratory model of a tailings pond and in the field. Of particular importance to the design of safe slopes, all data indicated that the phreatic surface within a tailings dam is concave upward, a configuration opposite that in most earth dams. The close correlation between predicted and experimental values confirmed the practicability of using the finite-element technique to design safe tailings dams.
W71-07455

EFFECT OF RAIN COLLECTING BASINS ON THE YEARLY INFLUX OF POLLUTANTS INTO A SEWER MAIN: FUNDAMENTALS OF DIMENSIONING COLLECTING BASINS,
For primary bibliographic entry see Field 05G.
W71-07527

STORM WATER/SEWAGE CONTROL,
For primary bibliographic entry see Field 05D.
W71-07528

FINE-MESH MECHANICAL SCREEN CONCENTRATES PEAK WASTE LOADS.
For primary bibliographic entry see Field 05D.
W71-07534

BED LOAD TRANSPORTATION IN ALLUVIAL CHANNELS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 02J.
W71-07613

EFFECTS OF MECHANICAL CLEANING OPERATIONS ON FLOW IN LARGE CONDUITS,
Metropolitan Water District of Southern California, Los Angeles. Hydraulic Design Section.
George F. Horowitz, and Nelson N. Lee.
ASCE Proceedings, Journal of the Hydraulic Division, Vol 97, No HY 5, Paper 8110, p 677-689, May 1971. 13 p, 10 fig, 1 tab, 2 ref.

Descriptors: *Cleaning, *Open channel flow, *Canals, *Roughness (Hydraulic), *Water conveyance, California, Conduits, Closed conduit flow, Flumes, Irrigation canals.
Identifiers: *Canal cleaning, *Conduit cleaning.

By following a systematic cleaning and maintenance program in recent years, the Colorado River Aqueduct has been kept in condition to deliver substantially greater flows of water to the coastal plain of Southern California than it was originally designed to carry. The condition of the conduit surfaces is briefly described, as well as the annual cleaning operations designed to remove flow-impeding aquatic deposits from the walls of the conveyance system. An analysis of the variations in Manning's roughness coefficient n is presented for various components of the system. A comparison of such n values before and after mechanical cleaning of the aqueduct is given in summary form. (Knapp-USGS)
W71-07615

8C. Hydraulic Machinery

FLOW INVESTIGATION IN A FRANCIS TURBINE,
Institute of Turbomachinery, Graz (Austria).
H. Fachbach.
Paper 70-WA/FE-16, Transactions American Society of Mechanical Engineering Series D -- Journal of Basic Engineering, 1970. 9 p, 16 fig, 9 ref.

Descriptors: Hydraulic machinery, *Francis turbines, Turbine parts, Turbine runners, Turbine efficiency, Turbine blades, *Experimental data, Theoretical analysis, Fluid flow, Instrumentation, Boundary layer, Coriolis force, Circulation, Velocity, Losses, Impellers, *Turbines, Specific speed, Foreign research, Hydraulic design, *Hydraulic turbines.
Identifiers: Austria, Mechanical models, Analytical method.

Development of hydraulic machines during the past decades was characterized by empiric methods leading to high efficiencies but contributing little to knowledge of the flow field in the machinery. For computation and design, 1- or 2-dimensional methods combined with experimental results were often used. Recently, 3-dimensional analytical methods developed in the fields of compressors or gas turbines were used in designing hydraulic parts and computing flow data. All methods of analysis are based on assumptions; the usefulness to be tested by experimental investigations. Results of theoretical and experimental investigations of the flow in a Francis water turbine are presented. The flow visualization with the aid of rotating 5-borehole probes provides the relative velocities, the pressure and energy distribution, the slip factor, the boundary layers, and the secondary flow. Theoretical and experimental results are compared, and the usefulness of assumptions based upon computations is discussed. (USBR)
W71-07067

ON THE INFLUENCE OF WATER TURBINE CHARACTERISTIC ON STABILITY AND RESPONSE,
English Electric Co, Ltd., Netherton (England).
E. Goldwag.
Paper 70-WA/FE-15, Transactions American Society of Mechanical Engineers, Series D--Journal of Basic Engineering, 1970. 13 p, 15 fig, 14 ref.

Descriptors: Hydraulic machinery, *Hydraulic turbines, *Stability, Characteristics, *Machine design, Hydraulic engineering, Velocity, Head (Fluid mechanics), Accuracy, Fluid flow, Foreign research, High head, Low head, Mathematical analysis, Performance, Torque.
Identifiers: *Response time, Great Britain.

Given a real turbine characteristic, equations giving discharge and torque can be derived in terms of certain characteristic slopes, speed changes, and pressure deviations. For reaction turbines, the flow through the machines is speed-dependent and the effect of this phenomenon on the pressure dependence of flow is significant. Conventional representation of the pressure dependence of torque is cor-

rect only in the case of one particular type of turbine. A formula allowing establishment of the correct relationship for any characteristic is given. Nonlinearities of the quantity-gate and torque-gate relationships are examined, and the concept of the effective gate is introduced to improve accuracy of any predictions. Modified relationships are used in establishing the bounds of the region in which stable operation of a unit can be achieved, depending on the slope of the appropriate unit quantity-unit speed curve. Governor parameters leading to critical damping are a function of this characteristic slope. Neglecting the speed dependence of the turbine discharge can result in significant errors, especially when dealing with low head and high head machines. (USBR)
W71-07068

HYSTERESIS CHARACTERISTICS OF FRANCIS PUMP-TURBINES WHEN OPERATED AS TURBINE,
Hatachi Ltd., (Japan)
M. Yamabe.
Paper 70-FE-D, Transactions American Society of Mechanical Engineers, Series D -- Journal of Basic Engineering, 1970. 5 p, 8 fig, 1 tab, 2 ref.

Descriptors: *Francis turbines, *Pump turbines, *Hysteresis, Design, *Characteristics, Experimental data, Pumped storage, Specific speed, Turbine parts, Foreign research, Turbine runners, Guide vanes, Fluid flow, Cavitation, Hydraulic machinery, Turbine efficiency, Torque, Prototypes, Model studies, *Hydraulic turbines, Pumps.
Identifiers: Japan, Mechanical models.

Pump turbines for pumped storage projects have a broad range of operating head when compared with turbines for conventional generating plants. Proper adjustment must be given to guide vane and runner vane openings to maintain a good operating condition at all times. Accordingly, when a Francis pump turbine of fixed-vane type is used on pumped storage projects, a poor flow condition is unavoidable under certain condition of operation. Results obtained through experiments on models to determine the phenomena of the hysteresis characteristics of Francis pump turbines generated when operated as a turbine are described. The condition for generating the phenomena is regulated by the cavitation factor and guide vane openings and is affected by the specific speed of a pump turbine. Some additional characteristics of the flow state within a runner are discussed. (USBR)
W71-07069

NEW CONCEPTS IN ROTARY DRILLING BITS,
Smith Tool Co., Houston, Tex.
L. L. Garner.
Paper, Spring Meeting, Pacific Coast District, Division of Production, American Petroleum Institute, May 13-15, 1969, Los Angeles, California. Drilling-DCW, Nov 1969. 6 p.

Descriptors: *Drilling, *Oil industry, *Drilling equipment, Rotary drilling.
Identifiers: *Drill bits, Sealed bearing bits, Carbide bits, Bottom hole jet bits, Mud motor bits.

When drilling specific rock types, the basic design concept principles of 3-cone rotary drill bits in recent years has remained relatively constant with no significant changes. New applications, developments and improvements utilizing the same design principles are changing some of the oil concepts, creating many new and interesting trends. These new design areas, including applications, developments and improvements did not in all cases necessarily improve due to bit development. For example, most design developments improved in steps. Sometimes the breakthrough or advance was due to other related support equipment such as drill pipe, new mud pumps, circulation material etc. There are drilling tools which in the past have seen limited use due to the fact the right idea or application took time in developing. Replacement of roller bearings with friction bearings in rotary rock bits has seen limited success until recently, due to improved seals. Tungsten carbide bits in the past have been used, generally to drill only hard formations. Design changes following the same general concept of milled tooth designs are now using tungsten carbide bits to drill even softer rock. Bottom hole jets will be utilized more, as recent tests indicate their usefulness in conjunction with downhole mud motors. Mud motor bits or rotary bits, modified in recent years to resist the skidding and abrasion wear created when used with high speed down hole motors, are being improved and will be more widely used. (Campbell-NWWA)
W71-07205

8D. Soil Mechanics

A REVIEW OF APPLICATIONS OF THE FINITE ELEMENT METHOD OF ANALYSIS TO PROBLEMS IN SOIL AND ROCK MECHANICS,
Corps of Engineers, Vicksburg, Mass.; and Texas Univ., Austin.
N. Radhakrishnan, and L. C. Reese.
Soils and Foundation, Vol 10, No 3, p 95-112, Sept 1970. 18 p, 85 ref, append.

Descriptors: *Finite element method, *Soil mechanics, *Rock mechanics, Bearing capacity, Culverts, Embankments, Piles (Foundations), Analytical techniques, Seepage, Slope stability, Soil dynamics, Displacements, Soil engineering, *Reviews, *Bibliographies, Computer applications, Stress, Earth pressure, Settlement (Structural), Deformation, Numerical analysis.
Identifiers: Soil modulus.

The finite element method of analysis has been applied to a wide variety of problems in soil and rock mechanics. Developments and applications of the method to problems in slope stability, embankments, culverts, pavements, bearing capacity, piles, soil dynamics, seepage, and rock mechanics are reviewed. The finite element method is essentially a systematic numerical procedure for solving boundary values and some initial problems in continuum mechanics. High-speed digital computers have accelerated the development and use of this technique in several fields of civil engineering. Advantages of the finite element method compared to other numerical approaches are numerous. The method can handle: complicated, realistic geometries; layered isotropic or anisotropic materials with linear, nonlinear, or viscous properties; mixed boundary conditions; and constructional sequences in earth building operations. These features are particularly useful for solving problems in soil and rock mechanics. Good comparisons between results of the finite element solution and field and laboratory observations are reported. (USBR)
W71-07073

THE SAN FERNANDO, CALIFORNIA, EARTHQUAKE OF FEBRUARY 9, 1971.
Geological Survey, Washington, D.C.

For sale by Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $2.25. Joint publication of US Geological Survey and National Oceanic and Atmospheric Administration: Geological Survey Professional Paper 733, 1971. 254 p.

Descriptors: *Earthquakes, *California, Reviews, Surveys, Earthquake engineering, Faults (Geology), Seismic studies, Disasters, Landslides, Land subsidence, Movement, Reservoirs, Reservoir design, Dam failure.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971).

The violent tremors that shook the San Fernando area of California on the morning of February 9, 1971, are a reminder that earthquakes are a natural and permanent part of the environment in sizeable areas of the United States. Had the Lower Van Norman Lake Dam, which was close to collapse when the earthquake ended, actually failed, the San Fernando earthquake might have become in famous as the deadliest in United States history. The ground accelerations produced by this moderate magnitude (6.6) earthquake were the highest ever recorded, that is, in the 0.5- to 0.75-g range with several high-frequency peaks to 1 g. This report is a preliminary evaluation of data gathered by many groups of investigators during the first 3 weeks after the earthquake. A list of cooperating organizations is given. (See also W71-07660 thru W71-07663) (Knapp-USGS)
W71-07659

LANDSLIDING IN THE VICINITY OF THE VAN NORMAN LAKES,
Geological Survey, Washington, D.C.
T. L. Youd.
In: The San Fernando, California, Earthquake of February 9, 1971, Geological Survey Professional Paper 733, p 105-109, 1971. 5 p, 3 fig, 3 ref.

Descriptors: *Landslides, *Earthquakes, *California, *Hydrogeology, *Pore pressure, Soil mechanics, Groundwater, Soil strength, Faults (Geology), Disasters, Land subsidence, Dam failure, Movement, Reservoirs.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971), *Van Norman Lakes (Calif).

In the Van Norman Lakes area of Los Angeles, California, the 1971 earthquake triggered a large number of landslides, some of them down very gentle slopes. The Van Norman Lakes lie in a valley eroded in north-dipping strata of the Saugus and Modelo Formations. The lakes are impounded at their south ends by dams constructed across the valley. Because of the reservoirs and a confined aquifer in the Little Tujunga syncline, the water table in the general area is at a relatively high level and intersects the surface at several locations. The most reasonable explanation for slippage on slopes of such low gradient is that the underlying soil were partially or completely liquefied during the earthquake. The many sand boils observed on or near the slide are evidence that this occurred. It is probable that movements on many, if not all, of the slides in the alluvium surrounding the Van Norman Lakes were directly attributable to increased pore water pressures generated by the earthquake. (See also W71-07659) (Knapp-USGS)
W71-07660

WATER RESOURCES ASPECTS,
Geological Survey, Washington, D.C.
A. O. Waananen, and W. R. Moyle, Jr.
In: The San Fernando, California, Earthquake of February 9, 1971, Geological Survey Professional Paper 733, p 119-125, 1971. 7 p, 3 fig, 2 tab, 2 ref.

Descriptors: *Landslides, *Earthquakes, *California, *Hydrogeology, *Pore pressure, Soil mechanics, Groundwater, Soil strength, Faults (Geology), Disasters, Land subsidence, Dam failure, Movement, Rservoirs.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971), *Van Norman Lakes (Calif).

Damage to hydraulic structures constituted a major impact on water resources of the San Fernando earthquake of February 9, 1971. The effects on the water resources of the region included noticeable fluctuations in the stages of streams and reservoirs and water levels in wells, the roiling of water in water-supply systems, short-term changes in groundwater levels. The major damage was caused by the principal M6.6 shock that occurred at 0601 hours February 9. The Van Norman Lakes, a series of reservoirs at the head of the San Fernando Valley, suffered severe damage. The earth dams on both the Upper and the Lower Van Norman Lake were severely damaged by the earthquake. The dam at the upper lake moved about 2 m downstream and the crest slumped substantially. The dam on Lower Van Norman Lake, initially completed in 1918, was fractured, the c

mped, and a large part of the upstream concrete ing of the dam slid into the reservoir. Fortunate- the dam was not breached. (See also W71-659) (Knapp-USGS)
71-07661

MAGE TO CONSTRUCTED WORKS, AS-CIATED WITH SOIL MOVEMENTS AND UNDATION FAILURES,
ological Survey, Washington, D.C.
L. Youd, and H. W. Olsen.
The San Fernando, California, Earthquake of 9, 1971, Geological Survey Professional Paper 3, p 126-132, 1971. 7 p, 8 fig.

scriptors: *Earthquakes, *California, *Reviews, rveys, Earthquake engineering, Faults (Geolo-, Seismic studies, Disasters, Landslides, Land sidence, Movement, Reservoirs, Reservoir ign, Dam failure.
ntifiers: *San Fernando (Calif), *San Fernando thquake (1971).

s report describes earthquake damage to dams canals, transportation routes, utilities, and ldings in the northern San Fernando Valley that caused by, or associated with, various types of movements and foundation failures. Because reconnaissance was relatively brief and limited cope, the information presented is a preliminary partial account of these types of damage. The ruary 9 earthquake severely damaged the per and Lower Van Norman Dams. The latter eared to have been on the brink of failure, ch would have created catastrophic inundation the heavily populated area below. Eighty usand people were forced to abandon their nes for 4 days while the water level in the reser- was lowered to a level which would preclude ding in case of further damage to the dam dur- strong after-shocks. In the vicinity of the Van rman Lakes, sections of several canals were ly damaged and rendered unusable until major airs could be made. Several flood-control dikes suffered slumping, but because they were not ounding water at the time of the shock, their ure presented no immediate hazard. The prin- al damage to the Lower Van Norman Dam was a sive upstream slope failure which dislodged a or segment of the earthfill embankment and osited it on the reservoir floor. (See also W71-59) (Knapp-USGS)
1-07662

MAGE TO WATER SUPPLY SYSTEMS,
ifornia Univ., Los Angeles.
Martin Duke.
The San Fernando, California, Earthquake of 9, 1971, Geological Survey Professional Paper , p 225-240, 1971. 16 p, 12 fig, 1 tab.

criptors: *Earthquakes, *California, *Reviews, rveys, Earthquake engineering, Faults (Geolo- Seismic studies, Disasters, Landslides, Land sidence, Movement, Reservoirs, Reservoir gn, Dam failure.
ntifiers: *San Fernando (Calif), *San Fernando thquake (1971).

California earthquake of February 9, 1971, did nsive damage to water-supply systems and their ponents. Most of this damage occurred in and und the most heavily shaken area, which in- led Sylmar, San Fernando, the Van Norman ervoirs, and the Jensen Filtration Plant. Types damage ranged from major dam failures to nkage of house connections for water and age, and included trunkline breaks, aqueduct tunnel damage, and structural failures in a or filtration plant. Strong-motion accelero- phs and seismoscopes functioned at several s. (See also W71-07659) (Knapp-USGS)
1-07663

8E. Rock Mechanics and Geology

A NEW METHOD FOR THE DETERMINATION OF DEFORMABILITY IN ROCK MASSES,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
M. Rocha, and J. N. da Silva.
Proceedings 2nd Congress International Society of Rock Mechanics, Theme 2, No 21, Belgrade, Yugoslavia, Sept 1970. 15 p, 26 fig, 3 tab, 8 ref.

Descriptors: Rocks, *Deformation, Deformation modulus, Measurement, Field tests, Equipment, *Rock mechanics, *Rock properties, *Flat jack method.
Identifiers: Dilatometers.

A new method for determining deformability in rock masses is presented to show how large undisturbed volumes can be tested quickly and economically. The method essentially consists of applying pressures using thin flat jacks in slots cut with a diamond disk at the surface of the rock mass. The authors describe the machines developed, indicate the procedure for calculating the modulus of deformability of the rock mass from the openings measured in the slots, discuss the problem of the characterization of deformability in rock masses by resorting to correlations between results of the new method and results of dilatometer tests, and present instances of application of the new method. (USBR)
W71-07065

A REVIEW OF APPLICATIONS OF THE FINITE ELEMENT METHOD OF ANALYSIS TO PROBLEMS IN SOIL AND ROCK MECHANICS,
Corps of Engineers, Vicksburg, Mass.; and Texas Univ., Austin.
For primary bibliographic entry see Field 08D.
W71-07073

STUDIES OF PROPERTIES AND CONDITIONS OF ROCK MASSIFS BY SEISMIC ACOUSTICS METHODS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Meloratsii, Moscow (USSR).
A. G. Sykoshin.
Proceedings 2nd Congress International Society of Rick Mechanics, Theme 1, No 14, Belgrade, Yugoslavia, Sept 1970. 7 p, 4 fig, 8 ref.

Descriptors: Rocks, *Fissures, *Joints (Geology), Site selection, Test procedures, *Seismic investigations, Anisotropy, *Rock mechanics, *Rock properties, *Seismic tests, Heterogeneity, Deformation, Ultrasonics, *Rock tests, Ultrasonic tests.
Identifiers: *Acoustic method.

The report deals with the procedures used and results obtained after the application of seismic-acoustic methods to study jointing, anisotropy, and heterogeneity of rock masses, as well as the influence of these factors on deformation properties of rocks. A special feature of the procedure is the application on a large scale of the multifrequency modifications of seismic acoustics (seismic, acoustic, and ultrasound methods). The studies determine: (1) the qualitative properties of jointing (volume of joints, prevailing directions of joint systems, and properties of joint filling); (2) the grade, character, and nature of anisotropy; and (3) the heterogeneity and dimensions of the heterogeneity elements (blocks). (USBR)
W71-07074

DETERMINATION OF ELASTIC PROPERTIES OF ROCKS USING VARIOUS ON-SITE AND LABORATORY METHODS,
Dames and Moore, Seattle, Wash.
M. Bukovansky.
Proceedings 2nd Congress International Society of Rock Mechanics, Theme 2, No 9, Belgrade, Yugoslavia, Sept 1970. 4 p, 1 tab, 8 ref.

Descriptors: Rocks, Elasticity (Mechanical), Field tests, Loading tests, Laboratory tests, Boreholes, Sandstone, Schist, Modulus of elasticity, Dolomite, *Rock properties, *Rock mechanics, *Plate load tests, Flat jack method.
Identifiers: Plate bearing tests, Czechoslovakia, Dilatometers, Radial jacking tests, Bedding.

Elastic properties of the rock mass comprise important input data for all engineering analyses; numerous laboratory and on-site methods have been developed for determining the elastic properties. A research program was conducted for high-pressure water tunnels on various sites in Czechoslovakia. Several static methods have been used for elastic properties determination, such as laboratory tests, borehole dilatometer tests, plate-load tests, flatjack tests, and radial jacking tests. Three different rock types have been tested: thick-bedded sandstones, highly fractured dolomites, and jointed crystalline schists. The plateload test is one of the simplest and most reliable methods for modulus estimation. Only when wide-spaced jointing or bedding occurs do radial jacking tests or calculation of the rock mass modulus using, separately, rock substance and joint properties, provide reliable data. (USBR)
W71-07076

8F. Concrete

PRECAST, REINFORCED CONCRETE MEMBERS IN THE CONSTRUCTION OF WATER SUPPLY AND SEWERAGE SYSTEMS,
For primary bibliographic entry see Field 05G.
W71-07537

8G. Materials

CAN POLYMERS HELP YOUR COLLECTION SYSTEMS,
For primary bibliographic entry see Field 05D.
W71-07529

STRETCHING OF VISCOELASTIC LIQUIDS,
Delaware Univ., Newark.
M. M. Denn, and G. Marrucci.
American Institute of Chemical Engineers Journal, Vol 17, No 1, p 101-103, Jan 1971. 3 p, 3 fig, 11 ref. OWRR Project A-009-DEL (1).

Descriptors: *Viscous flow, *Liquids, *Viscosity, *Shear, *Viscometers, Tensile stress, Analytical techniques, Heat transfer, Velocity, Time, Tensile strength.
Identifiers: *Viscoelastic liquids, Liquid stretch rate.

Analyses of stretching of a viscoelastic liquid have been interpreted as showing that there is a maximum stretch rate to which the material can be subjected, and several physical phenomena have been explained on this basis. This report shows theoretically and experimentally that the concept of a limiting stretch rate does not have general validity. (Woodard-USGS)
W71-07598

8H. Rapid Excavation

PERFORMANCE OF TUNNEL BORING MACHINES,
Southern California Metropolitan Water District, Los Angeles.
R. J. Proctor.
Engineering Geology Bull AEG, Vol 6, No 2, p 105-117, Fall 1969. 13 p, 9 fig, 1 tab, 39 ref.

Descriptors: *Tunneling, *Tunneling machines, Tunnel construction, *Rapid excavation, Earth

handling equipment, Rock excavation, Rocks, Diversion tunnels, Earth movements, Hardness, Compressive strength, Mining, Geology, Faults (Geology), Performance, Statistics, *Boring machines, Construction equipment, Bibliographies. Identifiers: Greenside-McAlpine Tunneling Machine, Oso Tunnel, Colo.

Technological advances in tunnel boring machines are being made so rapidly that many present limitations soon will be overcome. Some information on the current performance of these machines and on tunneling events is desirable. More than 100 mole tunnels have been excavated in the world, the first being in Massachusetts in 1856. Some problems with moles, unconfined compressive strength related to moles, and specific references are discussed. Statistics cited are: (1) the largest mole cut a 36-ft 8-in.-dia tunnel for the Mangla Dam Diversion Tunnels system in West Pakistan; (2) the heaviest mole - 500 tons, excavated part of the Paris Subway; (3) the fastest mole excavation - cut 419 ft/day in the Oso Tunnel, Colorado; and (4) the hardest rock excavated by mole - 57,000 psi granite in Austria, 51,000 psi quartzite in Idaho, and rhyodacite in Nevada with a Mohs' hardness slightly greater than 7. (USBR)
W71-07066

IMMERSED TUNNEL CONSTRUCTION,
H. C. Wentink.
In: Advisory Conference on Tunneling of the Organization for Economic Co-Operation and Development, Aug 1970. 42 p.

Descriptors: *Tunneling, *Construction, *Underground structures.
Identifiers: *Immersed tunnels, Technological improvement, Questionnaire.

The document is concerned with tunnels composed of elements constructed in a dry-dock or on a slipway and subsequently transported to the construction site, where they are sunk, placed on a foundation, and connected together under water. The questionnaire dealing with immersed tunnels brought in replies from twelve countries, many of which were based only on a theoretical knowledge of the subject or on experience with tunnels of very small cross-section.
W71-07507

HARD ROCK TUNNELING,
T. E. Howard.
In: Advisory Conference on Tunneling of the Organization for Economic Co-Operation and Development, Aug 1970. 74 p.

Descriptors: *Tunneling, *Construction, *Underground structures, Drilling.
Identifiers: *Hard rock tunneling, Technological improvement, Questionnaire.

The report is intended to facilitate the orderly development of tunneling technology by focusing attention on the inadequacies of rock tunneling and the improvements that are needed. The data presented were derived from the results of a comprehensive questionnaire that was completed by individuals and organizations in 17 countries.
W71-07508

BOSTON STILL FACES A POLLUTION CONTROL PROBLEM: DEEP TUNNEL PLAN PROPOSED AS SOLUTION,
Joseph Cazzaza.
Water Wastes Eng, Vol 7, No 9, p 44-47, Sep 1970.

Descriptors: *Water pollution control, *Pollution abatement, Sewers, Sewerage, Treatment facilities, Massachusetts.
Identifiers: *Deep tunnel plan, *Boston (Mass).

In this article the related development of combined sewerage systems in the Boston metropolitan area is traced and some of the major attempts to abate pollution in the harbor and its estuaries are discussed. Presently, the sewage from the area south of the old Boston Main Drainage District is treated at the Nut Island plant, while most of the sewage from the remaining Metropolitan Sewerage District is treated at the Deer Island plant. The two plants provide primary treatment and chlorination for all dry-weather flows from the metropolitan area, yet they cannot handle the enormous quantities of mixed flows during storm conditions. A description of the deep tunnel plan, with an estimated construction cost of $430 million, is included.
W71-07509

RESEARCH AND DEVELOPMENT RELATED TO TUNNELING.
Organization for Economic Co-Operation and Development, Paris (France).

In: Advisory Conference on Tunneling of the Organization for Economic Co-Operation and Development, Aug 1970. 108 p.

Descriptors: *Tunneling, *Research and development, Construction, Underground structures.
Identifiers: Questionnaire.

The document is concerned with the status of applied research and development relating to tunneling technology. Applied research and development means theoretical and experimental studies of new design methods and construction techniques, including studies of the properties, character and behavior of tunnel structures, and of the ground mass in which they are constructed.
W71-07510

CUSTOM DESIGNED SHIELD LEAVES NO SPACE BEHIND AS IT SETS TUNNEL RINGS.

Construct Methods Equip, Vol 52, No 8, p 64-67, 70, 72, Aug 1970.

Descriptors: *Drilling, *Tunnel construction, *Tunneling machines, Tunnel design.
Identifiers: *Tunneling shield, *Mexico.

A tunneling shield used to drive a 30-ft diameter bore at shallow depths in soft, unstable ground, was designed to progress through drive cycles without leaving an annular space behind the shield after the shove had been made. The tunnel was driven up a constant incline having profile variations of from 0.8 to 7% at depths ranging from 52 1/2 feet to 16 feet below street level. Guidance made use of a laser and target system; excavation was performed by a dozen miners working from the shield's six breasting tables with pneumatic spades and rock breakers. A description of the tunneling cycle is given.
W71-07511

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES CENTER: ANNUAL REPORT, 1 JULY 1968 - 30 JUNE 1969,
California Univ., Los Angeles. Water Resources Center.
Arthur F. Pillsbury.
California Water Resources Center, Report No 17, (1970). 143 p. OWRR Project A-999-CAL (4).

Descriptors: *Projects, *Research and development, Hydrologic cycle, Precipitation, Evaporation, Transpiration, Groundwater, Soil water, Soil-water-plant relationships, Chemical precipitation, Water yield improvement, Water conservation, Water management (Applied), Watershed protect. and flood prev. Act, Pollutant identification, Water pollution sources, Water pollution effects, Waste treatment, Ultimate disposal, Water treatment Water quality control, Planning, Evaluation, Cos allocation, Cost sharing, Pricing, Repayment con tracts, Water demand, Water law, Engineering Design, Financing.

This 1968-69 annual report reviews the researc and related activities of the University of Californi Water Resources Center. Water cycle studies in clude general precipitation, evaporation and trans piration, groundwater, water in soils, water an plants, and chemical processes. Water supply aug mentation and conservation includes water yiel improvements, and conservation in agricultur Water quality management and control studies in clude groundwater management and watershe protection. Water quality managment and protec tion includes identification of factors effectin degradation, sources and fate of degradation, e fects of degradation, waste treatment processes, u timate disposal of wastes, water treatment, an water quality control. Water resources planning in cludes techniques of planning, evaluation proces cost allocation, cost sharing, pricing/repaymen water demand, and water law and institutions. E gineering works include design. Each project listed and briefly summarized, with data on i vestigators, funding and publications (includi theses). (Popkin-Arizona)
W71-07153

THE UNIVERSITY'S ROLE IN NATIONA WATER POLICY.
For primary bibliographic entry see Field 06B.
W71-07183

ANNUAL REPORT 1969-70.
Hawaii Univ., Honolulu. Water Resourc Research Center.

Water Resource Research Center, University Hawaii, Honolulu, Hawaii, 1971. 60 p. OWRR Pr ject A-999-HI (5).

Descriptors: Hawaii, Domestic wastes, Storm r noff, Groundwater movement, Desalinization, A tificial recharge, Remote sensing, Evapotranspi tion, Institutions, Hydrogeology, Bibliograph Hydrologic data, Seawater.
Identifiers: *Stormwater, *Water tracing, Wa dating, Taiwan groundwater.

Annual progress report on the research program the University of Hawaii Water Resour Research Center: all work reported except one lates to Hawaii water resources and includes pol tion characteristics of domestic waste water fluents and stormwater, identification of the pol tion effects of sugarcane irrigation return wat pilot desalting of brackish groundwater domestic use, evaluation of artificial recharge pr tices in Hawaii, remote sensing of groundwa with electromagnetic radiation and mural ind tion methods, water tracing and dating with triti and radiocarbon, tidal effects on groundwa levels, water budget of sprinkler irrigated sug cane, Hawaii water resources institutions, updat Hawaiian hydrogeology documents, annota bibliography on Hawaii water resources, the des of hydrologic data network, thermal properties sea water, and geological confirmation of cert groundwater table configurations on the island Hawaii. The non-Hawaiian project is Taiw groundwater supply. (Lau-Hawaii)
W71-07682

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES CENTER: ANNUAL PORT, 1 JULY 1968 - 30 JUNE 1969,
California Univ., Los Angeles. Water Resour Center.
For primary bibliographic entry see Field 09A.
W71-07153

NNUAL REPORT 1969-70.
awaii Univ., Honolulu. Water Resources esearch Center.
or primary bibliographic entry see Field 09A.
71-07682

0. SCIENTIFIC AND TECHNICAL INFORMATION

ROUNDWATER POLLUTION FROM SANITA- Y LANDFILLS AND REFUSE DUMP ROUNDS, A CRITICAL REVIEW,

Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05E.
W71-07194

BIBLIOGRAPHY, SELECTED REGIONAL, STATE, AND OTHER GOVERNMENTAL AGENCY WATER RESOURCES PLANNING DOCUMENTS,
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
For primary bibliographic entry see Field 06A.
W71-07200

A BIBLIOGRAPHY OF ARCTIC WATER RESOURCES,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 02C.
W71-07333

SELECTING REGIONAL INFORMATION FOR GOVERNMENT PLANNING AND DECISION-MAKING,
California Univ., Los Angeles.
For primary bibliographic entry see Field 06B.
W71-07589

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PIERS, DREDGING, ETC, IN WATERWAYS.
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W71-07374 05D

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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
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al Research Lab., Washington, D.C.
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1-07761

ECT DETERMINATION OF THE ELEC-OMAGNETIC REFLECTION PROPERTIES SMOOTH BRACKISH WATER TO THE NTINUOUS SPECTRUM FROM 10 TO THE POWER TO 4 x 10 TO THE 9TH POWER RTZ,
vaii Univ., Honolulu. Water Resources earch Center.
primary bibliographic entry see Field 07B.
1-07974

. WATER CYCLE

. General

OBAL WATER BALANCE ACCORDING TO E PENMAN APPROACH,
vaii Univ., Honolulu; and Pennsylvania State ., State College.
primary bibliographic entry see Field 02D.
-07809

OBLEMS OF GLOBAL HYDROLOGY (RUS-N: PROBLEMY GLOBAL'NOY ROLOGII),
. Kalinin.
ngrad, Gidrometeorologicheskoye Izdatel'st-968. 377 p, 83 fig, 58 tab, 260 ref.

criptors: *Hydrologic cycle, *Runoff, *Sur--groundwater relationships, *Water resources elopment, Oceans, Lakes, River basins, Reser-s, Water balance, Aquifers, Water consump- Confined water, Water supply, Water purifi-on, Computers, Forecasting, United States.
tifiers: *USSR, Closed basins, Atmospheric ulation, International collaboration, Caspian

purpose of this monograph is to analyze the n's water balance and to examine its role in-ing the earth's surface and conditions for an life. Global hydrology, as a branch of ral hydrology, embraces such problems as (1) y of the water cycle and influence of human ac- on it; (2) spatial-temporal analysis of ologic processes for vast areas and for the n as a whole; (3) development of deterministic statistical patterns in the fluctuations of ologic processes; (4) identification of zones of hronous and asynchronous variations in ru- (5) paleographic reconstructions of the n's water regime; (6) long-range forecasts of tate of earth's water resources and their effects evelopment of processes taking place on earth; (7) study of the interrelationship of natural rs and formulation of scientific principles for rolling the water regime of vast areas. The ng section stresses the need for promoting in-ational cooperation among scientists in the of hydrology. (Josefson-USGS)
-07949

DY OF WATERSHED CHARACTERISTICS ECTING THE HYDROLOGIC PER-MANCE,
Inst. of Tech., Kharagpur. Dept. of Agricul- Engineering; and Soil Conservation Research, ning and Demonstration Center, Ootacmund ia).
primary bibliographic entry see Field 02E.

W71-08072

COMPARISON OF DIMENSIONLESS UNIT HYDROGRAPHS IN THAILAND AND TAIWAN,
Colorado State Univ., Fort Collins; and Asian Inst. of Tech., Bangkok (Thailand); and National Energy Authority, Bangkok (Thailand).
For primary bibliographic entry see Field 02E.
W71-08084

FLOOD PRODUCING RAINSTORMS IN ASSAM AND ASSOCIATED METEOROLOGICAL CONDITIONS,
Meteorological Office, New Delhi (India).
For primary bibliographic entry see Field 02B.
W71-08095

THE BRAHMAPUTRA DRAINAGE SYSTEM AND FLOODS IN THE ASSAM VALLEY,
Assam Directorate of Geology and Mining (India).
For primary bibliographic entry see Field 02E.
W71-08096

THE WATER BALANCE AND ITS TRANSFORMATION IN THE USSR (RUSSIAN: VODNYY BALANS SSSR I YEGO PREOBRAZOVANIYE).
For primary bibliographic entry see Field 04A.
W71-08104

EFFECTS OF CHANNEL CHARACTERISTICS ON TIME PARAMETERS FOR SMALL WATERSHED RUNOFF HYDROGRAPHS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
P. Golany, and C. L. Larson.
Available from the National Technical Information Service as PB-199 373, $3.00 in paper copy, $0.95 in microfiche. Minnesota, Water Resources Research Center, Bulletin 31, 1971. 130 p, 48 fig, 38 tab, 47 ref. OWRR Project No: B-007-MINN (5).

Descriptors: *Rainfall-runoff relationships, *Mathematical model, *Peak discharges, Watershed, Hydrographs, Storm runoff, Routing, Computer, Overland flow, Channels.
Identifiers: *Time parameters, *Time to equilibrium, *Watershed model, Time of concentration, Time to peak, Lag time.

Most, if not all, parametric methods for predicting peak runoff from small watersheds require some type of time parameter as part of the runoff routing. The effects of watershed characteristics such as length, slope and roughness of the main channel and watershed area on time parameters were investigated in this study. A mathematical model and a computer program were developed for solving the dynamic equations of continuity and momentum to route nonsteady runoff through a channel system. A theoretical equation for computing the time to virtual equilibrium (time required for the rate of runoff at the outlet to become equal to the supply rate) was derived. The results of the research indicate the relative effect of the overland flow on the time to virtual equilibrium of the watershed decreases as the watershed size increases, and vice versa. The time to virtual equilibrium decreases as the supply rate increases and the non-linearity of the runoff process is shown. (Walton-Minnesota)
W71-08121

2B. Precipitation

THE WORLD DISTRIBUTION OF ANNUAL PRECIPITATION EFFICIENCY,
Victoria Univ. (British Columbia).
Stanton E. Tuller.
Journal of Geography, Vol 70, No 4, p 219-223, Apr 1971. 2 fig, 1 tab, 7 ref.

Descriptors: *Climatic data, *Precipitable water, *Water vapor, *Precipitation (Atmospheric), *Climatic zones, Deserts, Meteorology, Weather data, Temperature, Tropical regions, Evaporation, Condensation, Synoptic analysis.
Identifiers: *Precipitation efficiency, *Dynamic precipitation mechanisms.

The atmospheric water vapor, acted upon by dynamic precipitation mechanisms, is the source of precipitation. The greater the precipitable atmospheric water vapor, the greater the latent heat supply available for the maintenance of precipitation. The amount increases with temperature and proximity to evaporative moisture sources and decreases with altitude. The maximum amounts are found over tropical oceans and decrease toward land, toward higher mountains and toward the poles. A world map of mean precipitable water vapor shows that it is poorly correlated with recorded precipitation. Some of the worlds major deserts have annual mean precipitable water vapor greater than Europe or most of the U.S. It therefore follows that the key to precipitation lies more with the active precipitation mechanisms which will cause the necessary lifting, cooling, condensation and droplet formation. Precipitation efficiency is the ratio of average daily precipitation divided by the mean precipitable water vapor, which gives an indication of relative atmospheric stability with time. It has been a neglected concept, until recently, because there was little available data on precipitable water vapor. A world map of precipitation efficiency is presented and discussed. High indexes are associated with regions of atmospheric instability and low indexes with atmospheric stability. (Casey-Arizona)
W71-07810

A SELECTED ANNOTATED BIBLIOGRAPHY OF ENVIRONMENTAL STUDIES OF IRAQ, JORDAN, LEBANON, AND SYRIA (1960 - 1969),
Environmental Technical Applications Center (Air Force), Washington, D.C.
Vincent J. Creasi, Dennis L. Boyer, and Alvin L. Smith, Jr.
Technical Note 70-5, May 1970. 27 p, 112 ref.

Descriptors: *Bibliographies, *Climatology, Environment, Meteorology, Climatic data, *Precipitation (Atmospheric).
Identifiers: *Middle East, Iraq, Jordan, Lebanon, Syria.

This bibliography contains 112 references to Environmental Studies concerning four Middle East Countries, Iraq, Jordan, Lebanon, and Syria. Approximately, 50 items are general references that pertain to one or more of the subject countries. Sixteen additional bibliographies of a meteorological and climatological nature are listed. Entries are listed alphabetically by author. A subject index is included for convenience of use.
W71-07838

THE STRUCTURE OF THUNDERSTORM RAINFALL,
Illinois State Water Survey, Urbana.
John B. Stall, and Floyd A. Huff.
Meeting Preprint 1330, American Society Civil Engineers National Water Resources Engineering Meeting, Jan 11-15, 1971, Phoenix, Ariz. 29 p, 12 fig, 7 tab, 17 ref.

Descriptors: *Thunderstorms, *Rainfall, *Storm structure, *Illinois, Radar, Cloudbursts, Flash floods, Runoff, Cloud physics, Rain gages, Peak discharge.
Identifiers: *Urban hydrology, *Chicago.

In the Midwest, heavy storm rainfall occurs most frequently from thunderstorm cells. The rain cell reaching the ground has a diameter of 3 to 6 miles, and area of 15 to 30 square miles, moves at a velocity of 20 to 30 miles per hour, and has a duration of 30 to 60 minutes. Most of the rainfall occurs

during the first 10 minutes; it occurs in 2 to 4 bursts, and 2 or 3 cells usually occur together. The resulting dynamic rainfall input onto an urban basin is a matrix in six dimensions of : depth, area, duration, frequency, sequence, and place. In consideration of the possible mean, inherent variability, and skew of each of these six parameters the resulting matrix is almost impossible to evaluate. Illustration are given of five traditional, two-dimensional plots dealing with various pairs of these six parameters or dimensions. Using point rainfall data for north-central Illinois, the Road Research Hydrograph Method is used for an urban basin in Chicago to show the effect of rainfall variability on the resulting flood runoff hydrograph. (Woodard-USGS)
W71-07924

MICROCLIMATOLOGICAL STUDIES OVER THE SEWARD GLACIER SNOWPACK,
Michigan Univ., Ann Arbor. Dept. of Geography.
For primary bibliographic entry see Field 02C.
W71-07960

CLOUD-SEEDING EXPERIMENT, TASMANIA, 22 DECEMBER 1966 TO 26 FEBRUARY 1969,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Radiophysics.
For primary bibliographic entry see Field 03B.
W71-07966

FREQUENCY ANALYSIS OF RAINFALL INTENSITIES FOR BOMBAY (COLABA),
Maharshtra Krishi Vidyapeeth (India). Dept. of Agricultural Engineering; and College of Agriculture, Poona (India). Dept. of Agricultural Engineering.
A. I. Patel, and S. S. Vanjari.
Journal of Soil and Water Conservation in India, Vol 18, Nos 1 and 2, p 13-21, 1969. 9 p, 2 fig, 2 tab, 24 ref.

Descriptors: *Rainfall intensity, *Depth-area-duration analysis, *Frequency analysis, Data collections, Runoff forecasting, Rational formula, Rain gages, Statistical methods.
Identifiers: *India, Bombay (India).

Rainfall records of Bombay (Colaba Observatory) were analyzed to develop rainfall intensity-duration-frequency curves. For this purpose frequency analysis of rainfall data over a period of 35 years from 1933 to 1967 was carried out using the Gumbel technique. Annual maximum rainfall intensities for each of the ten durations were calculated by analysis of self recording raingage charts. The extended duration principle was applied wherever data for longer durations were not available. Fisher-Tippett type I extreme value distribution was assumed to provide an acceptable fit to the data. Rainfall intensity-frequency curves for 5 minute, 10 minute, 15 minute, 30 minute, 1 hour, 2 hour, 4 hour, 8 hour, 16 hour, and 24 hour durations were developed. The length of record can be considered to be adequate when determined by applying Student's 't' at the 10% level of significance. (Knapp-USGS)
W71-08070

A STUDY OF THE RAINFALL OF THE LOWER GANGETIC BASIN FOR VARIOUS DURATIONS AND RETURN PERIODS,
Meteorological Office, New Delhi (India).
P. S. Harihara Ayyar, and B. L. Sharma.
Indian Geohydrology, Vol 5, No 1, p 11-25, Dec 1969. 15 p, 4 fig, 18 ref.

Descriptors: *Duration curves, *Depth-area-duration analysis, *Runoff forecasting, Distribution patterns, Hydrologic data, Mapping, Rainfall disposition, Irrigation water, Monsoons, Regions, Synoptic analysis.
Identifiers: *India, *Gangetic Basin (India).

A study of rainfall for one hour and 24-hour duration has been attempted for the lower Gangetic Basin of India, using Gumbel's Extreme values method. The magnitudes of rainfall likely to be reached or exceeded in one hour and 24 hours for various return periods are presented in the form of maps. About 80% of the area in the basin is arable. The annual rainfall of the area ranges between 110 and 170 centimeters. The rainfall generally decreases from the south-east to the north-west. The four monsoon months, June to September, constitute the main rainy season for the basin. However, appreciable rainfall occurs in the months of May and October. (Knapp-USGS)
W71-08094

FLOOD PRODUCING RAINSTORMS IN ASSAM AND ASSOCIATED METEOROLOGICAL CONDITIONS,
Meteorological Office, New Delhi (India).
P. S. Pant, S. D. S. Abbi, D. K. Gupta, and Harish Chandra.
Indian Geohydrology, Vol 5, No 1, p 26-43, Dec 1969. 18 p, 6 fig, 4 tab, 3 ref.

Descriptors: *Rainfall-runoff relationships, *Design storm, *Monsoons, *Synoptic analysis, *Duration curves, Depth-area-duration analysis, Hydrologic data, Flood forecasting, Runoff forecasting, Rainfall disposition, Distribution patterns.
Identifiers: Assam (India).

More than 100 rainstorms of durations ranging from 1-day to 7-day during the period 1901-1960 over the Brahmaputra Catchment in the Assam Plains of India were studied by the Isohyetal method. Enveloping curves of maximum depths for various durations are presented and discussed. Preferred regions for occurrence of concentrated rainfall were located. The synoptic situations associated with some of the flood producing heavy storms are also discussed. Rainstorms are most frequent in the month of June. Most of the storms are of duration of 2-4 days. The synoptic situation which is associated with the maximum number of storms is the extension of the eastern end of the monsoon trough over Assam. Preferred areas for occurrence of storms are all in the northern part of the catchment close to the foot hills. (Knapp-USGS)
W71-08095

PROBLEMS OF WATER SUPPLY FOR AGRICULTURAL OPERATIONS IN LOWER WEST BENGAL,
Calcutta Univ. (India).
For primary bibliographic entry see Field 3F.
W71-08099

USU TELEMETERING PRECIPITATION GAGE NETWORK,
Utah State Univ., Logan. Coll. of Engineering.
C. Earl Israelsen, and Don L. Griffin.
Bureau of Reclamation Contract 14-06-D-6003. Utah Water Research Laboratory Report PRWG 39-7, Apr 1969. 39 p, 2 tab, 8 fig, 1 ref.

Descriptors: *Network design, *Climatic data, *Precipitation, *Telemetry, *Remote sensing, Utah, Wyoming, Idaho, Precipitation gages, Instrumentation, Data collections, Data processing, Data storage and retrieval, Monitoring, Data transmission, Sites, Installation, Operation and maintenance.
Identifiers: Wasatch Weather Modification Project, Automatic Readout Console.

A network of telemetering precipitation gages, operating in mountainous northern Utah, western Wyoming and southern Idaho, is part of Wasatch Weather Modification Project. About 40 gages collected and reported data in the 1968-69 winter from up to 130 miles. The system includes an Automatic Readout Console from Mt. Logan to the Utah Water Research Laboratory. The console is the control center for the network, responsible for interrogating, printing, and transmission. Site and gage selection is discussed with non-technical information on installation, operation and maintenance. (See also W71-08132) (Popkin-Arizona)
W71-08131

TELEMETRY SYSTEM MODIFICATIONS AND 1968-69 OPERATION,
Utah State Univ., Logan. Coll. of Engineering.
Duane G. Chadwick.
Bureau of Reclamation Contract 14-06-D-6003. Utah Water Research Laboratory, Report PRWG 30-8, June 1969. 41 p, 7 fig, 4 tab, 4 ref.

Descriptors: *Network design, *Climatic data, *Precipitation, *Telemetry, *Remote sensing, Precipitation gages, Instrumentation, Data collections, Data processing, Data storage and retrieval, Data transmission, Monitoring, Operation and Maintenance, Variability, Failures, Costs.
Identifiers: Wasatch Weather Modification Project

The Wasatch Weather Modification Telemetering System operation is summarized for the winter of 1968-69. The system is the largest known radio-reporting precipitation network in inaccessible mountainous regions. The system operated for about 600 hours from 39 stations. Mean value standard error was 0.016 inch and 0.03 inch of precipitation for the 36-inch and 70-inch capacity precititation cans. Instruments were reliable, with electronic failures, and 5 battery failures. Causes of failures were analyzed and remedied. Telemetering operation costs for the season were $53,913 for direct costs on salaries, $8,665 for current expenses, and $17,098 for taravel, or $79,676 in total. Tables show station locations, operating record, telemetry logs, and estimates of standard error and variance. Figures show station locations, record data, data printout, transducer assembly, accuracy improvements, guide types, and rain-gage assembly. (See also W71-08131) (Popkin-Arizona)
W71-08132

METEOROLOGY AND THE MIGRATION OF DESERT LOCUSTS: APPLICATIONS OF SYNOPTIC METEOROLOGY IN LOCUST CONTROL,
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 03F.
W71-08133

EVALUATION OF CLIMATOLOGIC RECORDS FOR RATIONAL PLANNING OF LIVESTOCK SHELTERS,
Department of Agriculture, Columbia, Mo. Livestock Engineering and Farm Structures Research Branch; and Environmental Science Services Administration, Columbia, Mo.
For primary bibliographic entry see Field 03F.
W71-08144

2C. Snow, Ice, and Frost

AN ALGORITHM FOR NEEDLE ICE GROWTH
Michigan Univ., Ann Arbor. Dept. of Geography.
Sam I. Outcalt.
Water Resources Research, Vol 7, No 2, p 399-400, Apr 1971. 7 p, 5 fig, 1 tab, 20 ref.

Descriptors: *Ice, *Frozen soils, *Freezing, *Mathematical models, Thawing, Frost, Frost action, Frost heaving, Heat transfer, Heat budget.
Identifiers: *Needle ice, *Soil ice.

The morphology of needle ice growth is variable owing to entrapment of mineral soil particles, freezing plane depth, and banding. This paper attempts to link these morphologic variations to the needle growth environment by means of a simple algorithm. The algorithm is based on the hypothesis that morphologic variability can be traced to va

y in surface energy transfer, soil water tension, the thermal-hydraulic properties of the near-ace soil layers during needle evolution. (K-p-USGS)
1-07912

RPHOLOGY AND ABLATION PROCESSES GLACIER ICE,
higan Univ., Ann Arbor. Dept. of Geography.
rt R. Loomis.
Icefield Ranges Research Project Scientific ults, Vol 2, Bushnell, Vivian C., and Ragle, nard H., eds, American Geographical Society, York, and Arctic Institute of North America, ntreal, p 27-31, 1970. 5 p, 5 fig, 11 ref.

criptors: *Glaciers, *Glacial drift, *Ablation, imentation, Sediment transport, Geomorpholo-Sediments, Statistics, Surveys, Melting.
ntifiers: *Kaskawulsh Glacier.

erential ablation on debris-laden glacier ice has been recognized for its importance in produc-ice-cored topographical features. A study of tion rates on a medial moraine of the hawulsh Glacier is used in conjunction with ice-data and an equilibrium hypothesis of mass ement in the debris mantle to explain the phological form that the moraine assumes. At broad head of the moraine, topographic relief er the thin moraine cover is low. In a downgla-direction, the relief increases along the aine as the debris band narrows under the ef-s of lateral compression of ice along the junc-of the two ice arms. At the same time the till r thickens and ablation rates decrease. After a summer-melt seasons, the differential ablation rring between the ice of the ice core below the aine's debris mantle and the clean ice of the ad-nt glacier arms creates a prominent ice-cored aine ridge standing above the surrounding gla-surface. The combination of slope steepening ice-flow extension results in thinning and ading of the debris veneer, particularly along central ridge of the moraine. (Knapp-USGS)
1-07953

E COLLAPSE OF SOLIFLUCTION LOBES A FACTOR IN VEGETATION OCKFIELDS,
tland State Univ., Oregon. Dept. of Geography.
ry W. Price.
ncial assistance for research was provided by Arctic Inst of North America. This report previ-y appeared in Arctic, Vol 22, p 395-402, 1969.
Icefield Ranges Research Project Scientific ults, Vol 2, Bushnell, Vivian C, and Ragle, nard H, eds, American Geographical Society, York, and Arctic Institute of North America, ntreal, p 103-107, 1970. 5 p, 5 fig, 9 ref.

criptors: *Solifluction, *Glaciers, *Glacial , *Soil formation, Soil-water-plant relation-s, Sedimentation, Vegetation establishment, morphology.
ntifiers: *Blockfields, *Felsenmeer.

development of soil and vegetation in kfields through normal processes is very slow. surprising, therefore, to find in the Ruby Range outhwest Yukon Territory, tongues and islands egetation occurring amidst certain blockfields. collapse of solifluction lobes from upslope is gested as the mechanism responsible. The lobes from the more gentle solifluction slope of the onto the steeper slope of the blockfields, and ntually become unable to maintain themselves ause of steeper slope, change in composition of etation, and deeper active layer. Once the lobes collapse, they flow downslope carrying with n clumps of vegetation which may become blished somewhere along the mudflow channel evee. In this way small outposts of vegetation created and speed up a process which would erwise take indeterminately longer. (Knapp-GS)
1-07954

SEISMIC INVESTIGATION OF ICE PROPERTIES AND BEDROCK TOPOGRAPHY AT THE CONFLUENCE OF THE NORTH AND CENTRAL ARMS OF THE KASKAWULSH GLACIER,
Ohio State Univ., Columbus. Inst. of Polar Studies.
Gilbert Dewart.
In: Icefield Ranges Research Project Scientific Results, Vol 2, Bushnell, Vivian C, and Ragle, Richard H, eds, American Geographical Society, New York, and Arctic Institute of North America, Montreal, p 77-102, 1970. 26 p, 21 fig, 7 tab, 49 ref, append.

Descriptors: *Seismic studies, *Glaciers, *Ice, *Topography, Subsurface investigations, Structural geology, Movement, Crystallography, Seismic properties.
Identifiers: *Ice properties, *Kaskawulsh Glacier.

Seismic velocity inhomogeneity and anisotropy were studied in strongly deformed glacier ice, and the form and dimensions of that part of a subglacial valley where two large temperate glaciers merge were determined. The investigations were carried out during the summers of 1964 and 1965 at the confluence of the north and central arms of the Kaskawulsh Glacier in the St. Elias Mountains. According to the results of wide-angle seismic reflection measurements the mean vertical P-wave velocity in the glacier is 3.70 km/sec. At depths of 10-100 m the mean P-wave velocity is 3.63 km/sec, S-wave velocity is 1.74 km/sec and Poisson's ratio is 0.350. From 10-m depth to the surface the velocities of P and S waves decrease markedly to approximately 3.0 km/sec and 1.5 km/sec, respectively. It appears that velocity anisotropy is caused mainly by the foliation structure of alternating layers of clear and bubbly ice. When foliation is strong, velocity anisotropy from this cause predominates over velocity anisotropy due to crystallographic fabric. Crystallographic fabrics are seldom strong enough to cause significant velocity anisotropy. The greatest depth of ice in the central arm of the glacier and in the combined glacier is about 1000 m. The north arm is somewhat less deep. The base of the ice is lower than the glacier terminus, 40 km downglacier, but no bedrock depression was found at the confluence. Both glacier arms are roughly parabolic in cross section. There is no break in the slope of the valley wall where the glacier surface meets it. The valleys of the two arms merge at approximately the same junction at which the surface movements of the two glaciers merge into a uniform flow. (Knapp-USGS)
W71-07955

DEFORMATION OF SURFACE ICE AT A GLACIER CONFLUENCE, KASKAWULSH GLACIER,
Ohio State Univ., Columbus. Inst. of Polar Studies.
Peter W. Anderton.
In: Icefield Ranges Research Projection Scientific Results, Vol 2, Bushnell, Vivian C, And Ragle, Richard H, eds, American Geographical Society, New York, and Arctic Institute of North America, Montreal, p 59-76, 1970. 18 p, 16 fig, 1 tab, 25 ref.

Descriptors: *Glaciers, *Movement, *Rheology, Velocity, Stress, Strain, Surveys, Structural geology, Petrofabrics.
Identifiers: *Kaskawulsh Glacier, *Ice deformation (Glaciers).

Measurements of surface velocity at the confluence of the north and central arms of the Kaskawulsh Glacier show a progressive change from independent profiles across each arm towards a unified profile across the combined glacier. Strain-rate determinations near the point of confluence show that the surface ice flows through a changing stress field equivalent to simple shear with an increasing component of transverse compression. The stress field across the median line is characterized by dominant transverse compression and concomitant longitudinal extension. Surface structures such as fractures, folds, foliation, and lineation are related to the stress field at the confluence. Changes in optic-axis fabrics of the ice are also correlated with changes in the stress field near the point of confluence. Fabric symmetry probably reflects the symmetry of small-scale movements in the ice, particularly in fabrics where the optic-axis and noncrystallographic subfabrics are closely related in symmetry. (Knapp-USGS)
W71-07956

DENSITY VARIATIONS IN ALPHINE SNOW,
British Columbia Univ., Vancouver. Dept. of Geology.
Donald Alford.
Reprinted from Journal of Glaciology, Vol 6, p 495-503, 1969. In: Icefield Ranges Research Project Scientific Results, Vol 2, Bushnell, Vivian C, and Ragle, Richard H, eds, American Geographical Society, New York, and Arctic Institute of North America, Montreal, p 51-57, 1970. 7 p, 6 fig, 11 ref.

Descriptors: *Snowpacks, *Density, *Distribution patterns, *Density stratification, Temperature, Topography, Snowfall, Firn, Slopes, Snow cover.
Identifiers: *Snowpack density.

Stratigraphic studies of the annual snow layer in the Beartooth Mountains of south-western Montana and on Mount Logan in the St. Elias Range disclose a similar distribution density in the two areas. The average density of the pack, obtained by integrating a series of measurements taken at 5-10 cm vertical intervals over the total thickness of the annual layer, reaches a maximum value near a midpoint of the total elevation covered by each traverse and decreases lineraly toward the elevation extremes. A preliminary hypothesis relates the distribution of average snow-density values along slopes to a semi-stable zonation of near-surface air temperatures. (Knapp-USGS)
W71-07957

OPTICAL MEASUREMENTS ON SNOW,
Army Cold Regions Research and Engineering Lab., Hanover, N.H.
Malcolm Mellor.
Reprinted from Cold Regions Research and Engineering Lab. Research Report 169, 1965. In: Icefield Ranges Research Project Scientific Results, Vol 2, Bushnell, Vivian C, and Ragle, Richard H, eds, American Geographical Society, New York and Arctic Institute of North America, Montreal, p 43-50, 1970. 8 p, 9 fig, 1 tab, 8 ref.

Descriptors: *Snow, *Optical properties, *Refractivity, Absorption, Remote sensing, Snow surveys, Ice, Solar radiation, Snowpacks, Albedo, Snowmelt.

Spectral extinction measurements for the visual range were made on homogeneous snow samples prepared under controlled conditions, with snow density and grain size as variables. Comparative measurements were made on coarse-grained natural snow. Extinction coefficient was in the range 0.8 to 1.7 for fine-grained dense snow, and 0.16 to 0.37 for the coarse-grained snow. In the fine-grained snow, where scattering is thought to be the dominant attenuating process, there is a general decline of the coefficient as wavelength increases from 0.4 to 0.7 microns. In the coarse-grained snow, where absorption becomes significant, spectral selection was slight, with a weak minimum in the region 0.5 to 0.6 microns. For a given density the coefficient decreases as grain size increases, the rate of change varying with wavelength. Spectral reflectance measurements on natural snow are reported, and attenuation data are interpreted to give surface reflectivity for fine-grained snow. Diffuse reflection from fine-grained snow is believed to have little spectral dependence in the visual range, but with coarse-grained snow reflectance is expected to become inversely dependent on wavelength. It is suggested that optical principles might be applied in the measurement of snow structure, and also for remote sensing of snow-covered terrain. (Knapp-USGS)
W71-07958

STRATIGRAPHIC STUDIES OF THE WINTER SNOW LAYER, MOUNT LOGAN, SAINT ELIAS RANGE,
Montana State Univ., Bozeman, and Army Cold Regions Research and Engineering Lab., Hanover, N.H.
Donald Alford, and Charles Keeler.
Reprinted from Arctic, Vol 21, p 245-254, 1969. In: Icefield Ranges Research Project Scientific Results, Vol 2, Bushnell, Vivian C, and Ragle, Richard H, eds, American Geographical Society, New York, and Arctic Institute of North America, Montreal, p 37-42, 1970. 6 p, 5 fig, 1 tab, 10 ref.

Descriptors: *Snow, *Stratigraphy, Snow cover, Surveys, Firn, Profiles, Cross-sections, Climatology, Topography.
Identifiers: *Mount Logan.

A traverse study was made of near-surface snow properties in the King Trench area of Mount Logan, St. Elias Range. Based upon the assumption that these snow properties are related to thermodynamic processes operating during the depositional period, a climatological model of the King Trench relates the observed variations in snow properties along the traverse line to localized topographic obstruction or enhancement of katabatic air drainage. The near-surface climate of snow-covered slopes generally may be inferred partially from the interaction between local topography and katabatic flow. (Knapp-USGS)
W71-07959

MICROCLIMATOLOGICAL STUDIES OVER THE SEWARD GLACIER SNOWPACK,
Michigan Univ., Ann Arbor. Dept. of Geography.
Ray Lougeay.
In: Icefield Ranges Research Project Scientific Results, Vol 2, Bushnell, Vivian C, and Rangle, Richard H, eds, American Geographical Society, New York, and Arctic Institute of North America, Montreal, p 17-26, 1970. 10 p, 5 fig, 7 tab, 24 ref.

Descriptors: *Microclimatology, *Glaciers, *Micrometeorology, *Air circulation, Winds, Meteorology, Regimen, Data collections, Instrumentation, Meteorological data, Solar radiation, Alaska, Weather.
Identifiers: *Icefield ranges, *Seward Glacier.

Microclimatic observations for a ten-day period in the summer of 1965 on the upper Seward Glacier show that wind profiles closely approximate log-linear curves, as would be expected under the stable conditions characteristic of the period. Temperature profiles have a distinct double inversion pattern during daytime hours. Net radiation is the dominant heat source during each day of the period, whereas sensible and latent heat fluxes were almost insignificant due to low wind speeds and limited temperature ranges, with temperatures generally close to 0 deg C. (Knapp-USGS)
W71-07960

SNOW PREDICTION IN THE EASTERN UNITED STATES,
New York Univ., Bronx. School of Engineering and Science.
Jerome Spar, Edward A. Brandes, and Joseph N. Grillo.
Available from the National Technical Information Service as COM 71-00103, $3.00 in paper copy, $0.95 in microfiche. New York University, School of Engineering and Science, Geophysical Sciences Laboratory Report No TR-70-11, July 1970. ESSA Contract No E-4-70 (N).

Descriptors: *Synoptic analysis, *Forecasting, *Snow, *Snowfall, *Cities, Meteorology, Surveys, Reviews, Weather forecasting, Rainfall, Precipitation (Atmospheric).
Identifiers: *Urban hydrology, *Snow forecasting.

A climatological approach to the translation of synoptic-scale predictions of winter precipitation into mesoscale information was applied to the problem of rain-snow discrimination in the New York metropolitan area. The synoptic conditions necessary for the occurrence of heavy snow on the east coastal plain show no obvious characteristic antecedent patterns either 24 or 12 hours prior to onset of snow, and a wide diversity of patterns even at and after onset time. Localized hourly numerical forecasts generated through spatial interpolation by the Shuman primitive equation model for the 1969-1970 winter season are evaluated for seven eastern cities, and are found to predict precipitation occurrences too infrequently and too late. This systematic error appears to be due, at least in part, to the method of interpolating precipitation. The results of the snow prediction project are reviewed from the viewpoint of forecast application. (Knapp-USGS)
W71-07968

SNOW FENCES,
Road Research Lab., Crowthorne, England, Climate and Environment Section.
L. E. Hogbin.
Available from the National Technical Information Service as PB-195 954, $3.00 in paper copy, $0.95 in microfiche. Ministry of Transport (Crowthorne, England), Road Research Laboratory Report LR 362, 1970. 27 p, 17 fig, 5 plate, 1 tab, 11 ref.

Descriptors: *Snowpacks, *Snowfall, *Snow, *Check structures, *Barriers, Construction, Methodology, Construction materials, Snow management, Meteorology.
Identifiers: *Snow fences.

The mechanism of snow drifting and the action of a snow fence are described. A formula relating the siting of a fence to its height and construction is derived from experimental results. Recommendations are made for fence constructions including a portable fence, and for siting arrangements. (Woodard-USGS)
W71-08069

SUMMARY OF SNOW SURVEY MEASUREMENTS FOR ARIZONA AND PERTINENT PORTIONS OF NEW MEXICO 1939-1970,
Soil Conservation Service, Phoenix, Ariz.
Richard W. Enz.
Soil Conservation Service Cooperative Snow Survey Report, 1970. 73 p.

Descriptors: *Snow surveys, *Arizona, *Colorado River basin, *Snow cover, Water equivalent, Soil moisture, Sampling, Methodology, Data collections, Hydrologic data, Streamflow forecasting, Water yield, Runoff forecasting, Water management (Applied).

Summarized are all snow survey measurements made in Arizona and western New Mexico from 1938 through 1970 for which records are available. This report superseded all previous Arizona summaries, as all data has been carefully checked and notes corrected to eliminate sampling errors. Some snow courses have been shortened since the 1964 summary, so there may be slight changes from the previously published record. Snow survey activities in Arizona started in 1937 with the establishment of six snow courses along the Coronado Trail near Alpine. These are all still active and used in forecasting the Salt and San Francisco Rivers. Throughout the years, many more courses were added to provide better sampling distribution. At present there are 55 active snow courses on the major watersheds of the state. Eight of these are located on the Gila River headwaters in New Mexico. After all sample points have been measured, the depth of snow and water content columns are totaled and then divided by the number of samples to obtain average snow depth and average water content. (Woodard-USGS)
W71-08076

AIRCRAFT GAMMA-RAY SURVEY OF SNOW COVER,
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 07B.
W71-08085

POSSIBILITY OF PREDICTING WATER TUR BIDITY AS ILLUSTRATED BY THE OK RIVER BASIN (RUSSIAN: O VOZMOZHNOST PREDSKAZANIYA MUTNOSTI VODY N PRIMERE REK BASSEYNA OKI),
For primary bibliographic entry see Field 02J.
W71-08101

NEO-PLEISTOCENE CHANGES IN A LARG RIVER VALLEY USING THE ODER AS A EXAMPLE,
Wroclaw Univ. (Poland). Inst. of Geography.
Stanislaw Szczepankiewicz.
Geographia Polonica, No 14, p 23-33, 1968. 11 4 fig, 13 ref.

Descriptors: *Pleistocene epoch, *Glaciatio *Glacial drift, *Ice, *Erosion, Geologic time, R noff, Valleys, Topography, Profiles, Sedimentatio Geomorphology, Terraces (Geological), Sand Gravels, Loess.
Identifiers: *Poland, Oder River, Neo-Pleistoce relief, Inland ice, Aeolian processes.

In the Neo-Pleistocene relief of proximal valley several sections can be distinguished which differ the evolution of their forms of accumulation a erosion. In the zone between the fringe of the La Glaciation and the maximum range of glaciatio no ice marginal valley of a continuous character e ists; water runoff in a variety of directions is t rule, dictated by the ancient valley networ Results of the study show that in many instanc there is lack of evidence for establishing uniformi between right and left bank forms of relief, partic larly with respect to longitudinal profiles of riv valleys. The range of the Neo-Pleistocene glac tions clearly indicates a noncontinuity. Besides c matic and tectonic conditions, evolution of tra verse and longitudinal valley profiles in the regio depends, among other things, upon local sedime tation. The Oder Valley may be viewed as a uniq model for river valleys whose floors are orient proximally with respect to movement of inland i and which are situated within the range of t Pleistocene glaciations. (Josefson-USGS)
W71-08107

THE ECONOMIC AND SOCIAL IMPLIC TIONS OF SNOW AND ICE,
Southern Illinois Univ., Carbondale.
For primary bibliographic entry see Field 06B.
W71-08291

TEMPERATURE VARIATIONS IN A WATI RESERVOIR,
For primary bibliographic entry see Field 02H.
W71-08320

2D. Evaporation and Transpiratio

CARBON DIOXIDE AND WATER VAPO EXCHANGE IN ATRIPLEX LEAVES,
Australian National Univ., Canberra. Resea School of Biological Sciences.
R. O. Slatyer.
In, The Biology of Atriplex, Studies of the A tralian Arid Zone, Symposium held in Deniliq NSW, Oct 14-15, 1969, p 24-29, Pub 1970. 1 ta fig, 2 ref, 3 equa.

Descriptors: *Photosynthesis, *Transpirati *Soil gases, *Resistance networks, *Ana models, Water vapor, Water flow, Diffusion, Pl growth, Stomata, Carbon dioxide, Consumpt use, Water demand, Moisture content, Moist stress, Equations.
Identifiers: *Atriplex, *Net flux, *Response curv *Water-use efficiency, *Gas exchange, He Orache, Light-flux density.

synthesis and transpiration in Atriplex
he herb) are evaluated by analogy to an elec-
analogue, where carbon dioxide net flux and
vapor where net water vapor flux is E, water
lated to resistors. The transpiration equation
quals (cw-ca)/ (ra plus ri), vapor concentra-
cw at evaporation sites and ca in the bulk air,
eaf resistance is ri, and external resistance is
ne photosynthesis equation is A equals (ca'-
(ra' plus ri' plus rm), where A is net CO sub 2
ca' and cc' are CO sub 2 concentrations in
ir and cell, and ra', ri' and rm are resistance
sub 2 transport in air, gas phase of leaf, and
the cell. Characteristics of water vapor
ay are determined by cuticular and stomatal
nce. CO sub 2 response curves and water
on CO sub 2 exchange are related to the
. Relative water-use efficiency of a species is
ed by rate of net photosynthesis relative to
iration. Figures show a sketch to the model,
n of stomatal resistance with light-flux densi-
d ri with water content, CO sub 2 response
s, effect of water stress on photosynthesis,
iration and water-use efficiency. (Popkin-
na)
07808

BAL WATER BALANCE ACCORDING TO PENMAN APPROACH,
ii Univ., Honolulu; and Pennsylvania State
State College.
u Chang, and Gary Okimoto.
Grant No E-44-67 (G). Contribution No 20,
Resources Research Center, Hawaii Univer-
Geographical Analysis, Vol 2, No 1, p 55-67,
970. 3 fig, 1 tab, 60 ref.

iptors: *Evapotranspiration, *Climatic data,
r radiation, *Rainfall, *Water balance, Arid
Semiarid climates, Estimating equations.
fiers: *Potential evapotranspiration, *Water
t, *Water surplus.

Penman and Thornthwaite approaches to
tial evapotranspiration (PE) calculation are
ssed and compared. It is felt that the Penman
ach is based on sounder physical reasoning
ields more accurate data on both weekly and
nly bases. In spite of its accuracy, the Penman
la is complicated by the necessity of evaluat-
t radiation in terms of cloudiness or sunshine
on data. However, the original equation has
revised so that net radiation is estimated from
radiation records instead of sunshine dura-
Annual world PE values were calculated from
ata of 394 stations, according to most data.
methods yielded similar results from areas of
ely low annual solar radiation, but diverged
reater annual solar radiation, the greatest dif-
ces between the 2 methods being found in the
arid and arid tropics. Additionally Koppen
fications and Penman data show many diver-
es which are greatest in tropical deserts.
lly, wet season water surpluses are much less
dry season water deficits, and Penman esti-
of water surplus are much lower than
thwaite estimates. Africa and Australia have
ighest average PE's, and Europe has the
t. For all 6 continents, PE exceeds rainfall,
ne annual water deficit of 72 cms is only less
average rainfall by 3 cms. Water deficit ex-
water surplus by a 1/5 ratio. (Casey-Arizona)
07809

POTRANSPIRATION FROM AN IR-TED TURF UNDER ADVECTION OF DRY AT DAVIS, CALIFORNIA,
rnia Univ., Davis. Dept. of Water Science
ngineering.
Morgan, W. O. Pruitt, F. J. Lourence, S. M.
, and W. L. Decker.
Electronics Command, Atmospheric
ces Lab Research and Development Report
M 68-G10-1, Feb 1970. 95 p, 24 fig, 23 tab,
f, 2 append. USDA Grant DA-AMC-28-043-
10 DA Task No 1B062109A197-02.

Descriptors: *Evaporation, *Evapotranspiration, *Irrigated land, *Advection, *California, Methodology, Meteorological data, Instrumentation, Lysimeters, Infrared radiation, Winds, Model studies, Data collections, Latent heat, Vegetation, Soil-water-plant relationships.

Detailed micrometeorological data were collected during three periods in October 1966 and 1967 at Davis, California when dry northerly winds passed from an extensive dry area onto a moist irrigated grass field. The two studies which comprise this report use these data to test several advection models. Goltz and Pruitt, using 13-14 October 1966 data and three independent methods studied the horizontal extent of the transition zone of surface evaporative flux and the magnitude and variation of evapotranspiration within this zone. The reduction of evapotranspiration 117 meters downwind from the leading edge of an irrigated grass field under conditions of strong advection of cool dry air was 20 to 25 percent, with all three methods providing compatible results. Indications were that even at this distance into the grass field, evapotranspiration reductions had not completely stabilized. Decker, using Philip's model for advection, tested the variation of evapotranspiration over the same irrigated grass field during conditions of mild advection of warm dry air represented by the 7 and 9 October 1967 data. He found that predicted values of surface evapotranspiration during inversion periods compared quite closely to values of evapotranspiration measured by the 20-foot weighing lysimeter located 100 meters downwind in the grass field. During periods without surface temperature inversions, however, the lysimeter evapotranspiration was 20 to 60 percent higher than the evapotranspiration predicted by the advection model. (Woodard-USGS)
W71-07971

EVAPORATION FROM WATER SURFACES BY DAY AND BY NIGHT,
Marie Curie-Sklodowska Univ., Lublin (Poland). Inst. of Geography.
Edward Michna.
Geographia Polonica, No 14, p 159-164, 1968. 6 p, 3 tab, 9 ref.

Descriptors: *Evaporation, *Air-water interfaces, *Evaporators, *Meteorological data, Instrumentation, Measurement, Seasonal, Diurnal, Nocturnal.
Identifiers: *Poland, Carpathian Mountains, Water surface.

A quantitative determination of the amount of evaporation occurring by day and by night over a full 24-hour period is of great importance for hydrology and climatology. In investigating evaporation from a water surface the most appropriate period for nighttime evaporation must first be decided. The period between sunset and sunrise was picked in the belief that measurements made at the time the sun rises and sets would yield results which illustrate the true amount of evaporation during night and day. Evaporation from a free water surface was measured at the Research Station of the Physical Geography Laboratory of the Curie-Sklodowska University situated at Rownia (Western Bieszczady) and at the Meteorological Station of the State Hydrological and Meteorological Institute at Przemysl (the Carpathian Upland). Although measurements covered only a short period the results obtained indicate that nightly evaporation constitutes a large part of a 24-hour evaporation--particularly in the cooler season. It is believed that measurements of evaporation from water surfaces during the periods indicated yield true values of daytime and nighttime evaporation; calculated per hour of day and night, the values permit comparisons to be made between results obtained at various latitude sites. (Josefson-USGS)
W71-08110

AN ASPIRATED DIFFUSION POROMETER,
Commonwealth Scientific and Industrial Reasearch Organization, Canberra (Australia). Div. of Land Research; and Australian National Univ., Canberra. Research School of Biological Sciences.
G. F. Byrne, C. W. Rose, and R. O. Slatyer.
Agricultural Meteorology, Vol 7, No 1, Jan 1970. 5 p, 1 fig, 5 ref.

Descriptors: *Instrumentation, *Leaves, *Diffusivity, *Evaporation, Equipment, Measurement, Estimating equations, Resistance.
Identifiers: *Aspirated diffusion porometers, Diagrams.

The large aspirated diffusion porometer for measurement of leaf diffusive dimensions is accurate under laboratory conditions, but field conditions cause temperature gradients within the instrument, impairing its performance. Also, leaves of large dimensions must be used in taking measurements. A porometer designed for field use, which can also take measurements from small leaves, has been developed. The small interior volume of the instrument prevents temperature gradients from developing within it. Three detailed diagrams of the instrument, directions for its use, and formula for calculation of leaf diffusive resistance are included. (Yensen-Arizona)
W71-08143

THE SEASONAL MARCH OF THE SPATIAL PATTERN OF GLOBAL AND NET RADIATION IN WEST AFRICA,
Chicago Univ., Ill.
Simon Oyediran Ojo.
Journal of Tropical Geography, Vol 30, p 48-62, June 1970. 11 fig, 3 tab, 40 ref.

Descriptors: *Solar radiation, *Evapotranspiration, *Heat balance, Meteorology, Albedo, Estimating equations, Energy balance, Evaporation, Rainfall, Temperature, Humidity, Seasonal, Infrared radiation, Climatic zones, Climatology, Arid lands, Semiarid climates, Tropical regions, Boundary layers, Vegetation effects, Model studies, Geographical regions, Latitudinal studies, Mapping, Clouds.
Identifiers: *West Africa, *Sahara Desert, *Potential evapotranspiration, *Net radiation, *Bowen ratio.

There are many gaps in the current knowledge of radiational processes over the horizontal surface of West Africa. Little radiation data is available for the area and a theoretical model was therefore utilized which was based largely on indirect calculations using ordinary meteorological data. Total solar radiation consists of direct radiation (Q) and diffuse radiation (q). Observed solar radiation (Q and q) could be estimated with an equation utilizing data for maximum possible solar radiation, maximum possible sunshine hours and observed sunshine hours. Mean monthly values of Q and q were then mapped as isolines for West Africa in the months of January and July. Surface solar energy ranges from 500-275 ly/day. In both months, lowest values were along the Guinea coast due to cloud cover, while highest values were along the fringes of the Sahara. Zonal distribution patterns prevailed and are detailed. In July, longer day lengths prevailed, but this was offset by greater cloud cover so that average values were not very different from January. Net radiation (R)— (Q and q) (I-a) - I where a is albedo and I is effective outgoing radiation. Methods are presented for the estimation of I. Maps of R were constructed for alternate months of the year, and temporal and zonal fluctuations are discussed. Definite relationships exist between the heat balance components and both the water balance and hydrological cycle components. Equations are developed relating radiation terms to water balance and hydrological cycle terms. (Casey-Arizona)
W71-08148

2E. Streamflow and Runoff

DATA ERROR EFFECTS IN UNIT HYDROGRAPH DERIVATION (Discussion),
For primary bibliographic entry see Field 07A.
W71-07842

SURFACE RUNOFF FROM GRADED LANDS OF LOW SLOPES,
J. M. Laflen, and I. L. Saveson.
Trans Am Soc Agricultural Engrs, Vol 13, No 3, p 340-341, 1970. 4 fig, 2 ref.

Descriptors: *Mathematical studies, *Data collections, *Surface runoff, Estimating equations, Storms, Louisiana.
Identifiers: *Data analysis, Baton Rouge (La).

This paper reports on analysis of surface runoff data collected during 1962, 1963, and 1964 near Baton Rouge, La. The object of the data analysis was to develop reliable prediction equations for estimating peak rate and total amount of surface runoff from any storm. The hypothesis tested was that peak rate and total amount of surface runoff could be expressed as functions of precipitation, row slope, row length, and antecedent soil moisture. Some conclusions drawn from the experiment include: (1) the effect of antecedent soil moisture is independent of precipitation, if the peak rate of runoff is the dependent variable; (2) the effect of slope and length of surface runoff is not independent of precipitation; (3) a single, precipitation - intensity measure is sufficient for expressing the effect of precipitation on peak rate of surface runoff.
W71-07843

A PROPOSAL OF CLASSIFICATION OF VEGETATION HABITATS ON THE BANKS OF CZECHOSLOVAK WATER COURSES FROM THE HYDROLOGICAL STANDPOINT, (IN GERMAN),
Ceskoslovenska Akademie Ved, Prague. Botanicky Ustav.
Karel Kopecky.
English abstract. Archiv fur Hydrobiologie, Vol 66, No 3, p 326-347, 1969. 9 fig, 19 ref.

Descriptors: *Streams, *Rivers, *Banks, *Aquatic plants, *Streamflow, Hydraulics, Water levels, Floodwater, Velocity, Marshes, Flood plains, Erosion, Deposition (Sediments), Classification.

The proposed classification considers the vertical zonality of stream shores, the fluctuation of water level, and the rate of water movement of water courses. Depending on the position of the land and the extent of overflow, limited and broad inundation sites are recognized. Both groups are subdivided into marshes or quagmires, and flood plains of 3 degrees of inundation intensity and duration. The shores of water courses are further subdivided on the basis of the nature of denudation and deposition of eroded material. Within the substrata of comparable nutrient supply and outside the diffusion zone, the described sites support characteristic plant covers. (Wilde-Wisconsin)
W71-07879

COMPUTER DETERMINATION OF THE GEOMETRY AND TOPOLOGY OF STREAM NETWORKS,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences; and Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07A.
W71-07911

A METHOD FOR CHARACTERIZING THE RUNOFF POTENTIAL OF RAINFALL IN WATER HARVESTING SCHEMES,
Hebrew Univ., Rehovoth. Faculty of Agriculture.
For primary bibliographic entry see Field 03B.
W71-07913

REDUCING EXCESS READOUTS FROM DIGITAL STREAMFLOW RECORDERS,
Rocky Mountain Forest and Range Experimental Station, Tempe, Ariz. Hydrology Lab.
For primary bibliographic entry see Field 07C.
W71-07914

AN AUTOMATIC OUTFLOW MEASURING DEVICE,
Commonwealth Scientific and Industrial Research Organization, Deniliquin (Australia). Riverina Lab.
For primary bibliographic entry see Field 07B.
W71-07917

FLOODS IN PATILLAS-MAUNABO AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07926

FLOODS IN SALINAS AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07929

WATER-RESOURCES RECONNAISSANCE OF A PART OF THE MATANUSKA-SUSITNA BOROUGH, ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07930

FLOODS IN GUAYAMA AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07931

FLOODS IN SANTA ISABEL AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07932

FLOOD PLAIN INFORMATION, BAYOU METO AND TRIBUTARIES, JACKSONVILLE ARKANSAS.
Corps of Engineers, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W71-07933

FLOOD PLAIN INFORMATION, MIDDLE FORK FORKED DEEP RIVER AND TRIBUTARIES, VICINITY OF HUMBOLDT, TENNESSEE.
Corps of Engineers, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W71-07934

PRECIPITATION AND RUNOFF,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07936

LONG-RANGE FORECASTS OF RUNOFF FROM MOUNTAIN RIVERS OF SIBERIA (RUSSIAN: DOLGOSROCHNYYE PROGNOZY STOKA GORNYKH REK SIBIRI),
For primary bibliographic entry see Field 04A.
W71-07946

COMPUTATIONS OF WATER DISCHARGES IN RIVERS FROM A BASIN WATER YIELD (RUSSIAN: RASCHETY RASKHODOV VODY V REKAKH PO VODOOTDACHE S BASSEYNA),
V. I. Moklyak.
Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85, Moscow, p 3-10, 1969. 8 p, 4 fig, 4 tab, 7 ref.

Descriptors: *Discharge (Water), *Water yi
*Time lag, *Inflow, Runoff, Hydrographs, Eq
tions, Model studies, River basins.
Identifiers: *Ukraine, River basin yield, Tr
time.

An analysis of runoff formation in rivers with a t
lag in excess of one day has established tha
refined genetic runoff formulas depths of daily
flow are determined from water yield for a 2-3
period. The depth of inflow consists of a laye
water yield for which a coefficient may be ca
lated; for approximate computations it may be
sumed that it is between 0 and 0.3. An example
computation is given, which confirms the exped
cy of taking into account the nonsimultaneou
of a slope and channel runoff within a daily
period. For computation purposes, discharge
spring high water from the Kleven' River near S
povka for the year 1940 have been used. (Josef
USGS)
W71-07947

HYDROLOGICAL FORECASTS AND MODI COMPUTERS,
Gidromteorologicheskii Nauchno-Inssledova Tsentr, Moscow (USSR).
For primary bibliographic entry see Field 04A.
W71-07948

ROMANIAN RIVERS, HYDROLOGIC MO GRAPH (RIVRILE ROMANIEI, MONOGRA HIDROLOGICA),
Institute of Meteorology and Hydro Bucharest, Romania. Institutul de Metrol Bucharest (Rumania).
Constantin Diaconu, and Sorin Stanculescu.
Summaries in English, French, Russian Spanish. Institutul de Meteorologie si Hidrol Bucharest, 1971. 750 p.

Descriptors: *Rivers, *Surveys, *Stream *Hydrologic data, Data collections, Hydrogra Surface waters, Water balance, Runoff, W quality, Water yield, Sediment transport, Bed Suspended load, Water chemistry, Stream g Networks, Gaging stations, Hydrogeology.
Identifiers: *Romania.

This hydrological monograph of Romanian riv the result of five years of activity from 19 1969. The hydrographic problems of the rive work of Romania are outlined. Present hydr cal knowledge of runoff, suspended and bed transport, water temperature, frost phenon water balance, and chemistry are discussed tabulated. The monograph consists of the follo parts and chapters: watercourses network; r of research on Romanian rivers; present sta hydrological knowledge; runoff and physiogr cal conditions of runoff generation; river r regime; river supply sources; mean runoff; imum runoff; minimum runoff; suspended and load transport; water temperatures and phenomena; water balance; water chem biological aspects, hydrological parameters fo major rivers; theoretical and practical basi making hydrological forecasts; and trends of research. (Knapp-USGS)
W71-07950

HYDROLOGIC COMMUNICATIONS EX MENT ON THE APPLICATIONS TECHN GY SATELLITE (ATS-1),
Environmental Science Services Administr Silver Spring, Md.
For primary bibliographic entry see Field 07B
W71-07962

APPLICATION OF COMPUTER PROCE MULTISPECTRAL DATA TO THE CRIMINATION OF LAND COLLAPSE (S HOLE) PRONE AREAS IN FLORIDA,
Geological Survey, Tampa, Fla.; and Mic Univ., Ann Arbor. Infrared and Optics Lab.
For primary bibliographic entry see Field 07B
W71-07963

ROPOSED STREAMFLOW DATA PRO-M FOR SOUTH CAROLINA,
ogical Survey, Columbia, S. C.
rimary bibliographic entry see Field 07A.
-07970

OD STAGES AND DISCHARGES FOR LL STREAMS IN TEXAS,
ogical Survey, Austin, Tex.
rimary bibliographic entry see Field 07C.
-08047

FACE WATER SUPPLY OF THE UNITED TES, 1961-65: PART II. PACIFIC SLOPE NS IN CALIFORNIA, VOL 2, BASINS M ARROYO GRANDE TO OREGON E LINE EXCEPT CENTRAL VALLEY.
ogical Survey, Washington, D.C.
rimary bibliographic entry see Field 07C.
-08048

FACE WATER SUPPLY OF THE UNITED TES, 1961-65: PART 12. PACIFIC SLOPE NS IN WASHINGTON, VOL. 1. PACIFIC E BASINS IN WASHINGTON EXCEPT UMBIA RIVER BASIN.
ogical Survey, Washington, D.C.
rimary bibliographic entry see Field 07C.
-08049

LICATION OF AN ACOUSTIC STREAM-W-MEASURING SYSTEM ON THE UMBIA RIVER AT THE DALLES, GON,
ogical Survey, Menlo Park, Calif.
hell Smith.
r Resources Bulletin, Vol 7, No 1, p 69-78, 971. 10 p, 7 fig.

riptors: *Flowmeters, *Columbia River, am gages, *Discharge measurement, Open nel flow, Gaging stations, Velocity, Acoustics, umentation, Current meters, Discharge er), Streamflow.
ifiers: *Flowmeters (Acoustic).

ollect accurate, independent records of flow e Columbia River at The Dalles, Oregon, an stic streamflow-measuring system was in-d. This device measures velocity of flow by difference in traveltimes of acoustic pulses mitted through the water in each direction a diagonal path across the river. The flow of along the path increases the speed of one and retards the speed of the other. The dif-ce in time of travel is related linearly to the velocity along the path. Installation of the m, which is the first application of an acoustic meter in a large natural channel, was lected in April 1969. It has been in continuous ation since that date. The velocity index and r-surface elevation are used as a two-variable in the computation of flow. These variables, lated against current-meter measurements by use of specialized boat equipment, pro-a reliable basis for computations of instantane-nd daily mean discharges. (Knapp-USGS)
-08056

CHANCE A FLOOD WILL BE EXCEEDED PERIOD OF YEARS,
Conservation Service, Berkeley, Calif.
rshed Planning Party.
rimary bibliographic entry see Field 06A.
-08058

RMAL MAPPING OF STREAMS FROM ORNE RADIOMETRIC SCANNING,
ue Univ., Lafayette, Ind. Dept. of ciences; and Purdue Univ., Lafayette, Ind. for Application of Remote Sensing.
rimary bibliographic entry see Field 07B.
-08061

STUDY OF WATERSHED CHARACTERISTICS AFFECTING THE HYDROLOGIC PERFORMANCE,
India Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering; and Soil Conservation Research, Training and Demonstration Center, Ootacmund (India).
N. K. Tyagi, E. Raghunath, and V. Lekhmanan.
Journal of Soil and Water Conservation in India, Vol 18, Nos 1 and 2, p 7-12, Jan-June 1970. 6 p, 6 fig, 1 tab, 6 ref.

Descriptors: *Rainfall-runoff relationships, *Water yield, Topography, Drainage density, Drainage patterns (Geologic), Rainfall disposition.
Identifiers: *India.

The physiographic characteristics of watersheds affecting the peak flows and runoff yield are reviewed and evaluated. Hydrologic performance of two watersheds in the Nilgiris, India, are compared. The two watersheds selected for study show significant difference in runoff yield. The rainfall received by Kallarpallam is only 22% more than Kukkalhariahalla but the runoff is greater by 83%. Due to the insignificant difference in climatic variables the marked variation in hydrologic performance can be attributed only to physiographic factors such as total watershed relief, stream slope and drainage density. (Knapp-USGS)
W71-08072

FLOODS IN THE WAPSIPINICON RIVER BASIN, IOWA,
Geological Survey, Iowa City, Iowa.
Harlan H. Schwob.
Geological Survey Open-file Report, Feb 1971. 52 p, 2 fig, 19 plate, 2 tab, 6 ref.

Descriptors: *Floods, *Flood plains, *Flood forecasting, *Iowa, Hydrologic data, Rainfall-runoff relationships, Stream gages, Flow rates, Peak discharge, Historic flood, Flood control, Regional flood, Data collections.
Identifiers: Flood profiles, Standard Project Flood, Intermediate Regional Flood.

Flood information for 338 miles of the main stem and six tributaries of the Wapsipinicon River, Iowa is reported to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Included are flood-peak records, gaging-station records, frequency curves, and water-surface profiles. Outstanding floods resulting from extremely heavy rainfall occurred in the upper basin in 1968 and 1969. Those in 1968 produced the highest flood of record at the gaging station at Independence. The flood of 26,800 cfs (cubic feet per second) at this station was the greatest in the period 1933-70. A number of the smaller tributaries experienced floods more than five times the computed 50-year flood. No flood of record has exceeded the 50-year flood on the main stem from Anamosa. Flood-profile sheets show actual flood occurrences and computed profiles of the 25- and 50-year floods. A low-water profile and tabulated discharge indicate the range in elevation and discharge along the streams. (Woodard-USGS)
W71-08081

COMPARISON OF DIMENSIONLESS UNIT HYDROGRAPHS IN THAILAND AND TAIWAN,
Colorado State Univ., Fort Collins; and Asian Inst. of Tech., Bangkok (Thailand); and National Energy Authority, Bangkok (Thailand).
Edmund F. Schulz, Subin Pinkayan, and Chumporn Komsartra.
Nordic Hydrology, Vol 2, No 1, p 23-46, 1971. 24 p, 16 fig, 2 tab, 21 ref.

Descriptors: *Unit hydrographs, *Rainfall-runoff relationships, *Mathematical models, Hydrograph analysis, Base flow, Floods, Subsurface runoff, Hydrographs, Peak discharge, Time lag, Tropical regions.
Identifiers: *Thailand, *Taiwan.

The characteristics of dimensionless unit hydrographs were derived from floods from watersheds smaller than 1000 square kilometers in Thailand. These dimensionless unit hydrographs were compared with similar unit hydrographs derived from floods on Taiwan and with the unit hydrographs derived from a mathematical model developed from the theory of the instantaneous unit hydrograph. The unit hydrographs derived from the Thai watersheds had much longer base length and much longer time to peak than similar unit hydrographs derived from floods on Taiwan. This increase in length of response time is attributed to a larger component of subsurface runoff in the floods from tropical watersheds. (Knapp-USGS)
W71-08084

THE BRAHMAPUTRA DRAINAGE SYSTEM AND FLOODS IN THE ASSAM VALLEY,
Assam Directorate of Geology and Mining (India).
K. C. Prasad, and M. N. Talukdar.
Indian Geohydrology, Vol 5, No 1, p 44-49 Dec 1969. 6 p, 2 fig.

Descriptors: *Floods, *Silting, *Rainfall-runoff relationships, *Rivers, *River flow, Hydrographs, Flood forecasting, Flood control, Hydrograph analysis, Flood plains, Earthquakes, River forecasting, Streamflow forecasting, Routing, Watersheds (Basins).
Identifiers: *Brahmaputra River (India), *Assam Valley (India).

The Brahmaputra drainage basin of India has a catchment area of about 423,462 sq.km. falling mostly in the Himalayan, Assam, Naga and Barail Ranges. Precipitation in the entire catchment is heavy. Due to high gradient and drainage density in the catchment area the surface runoff quickly reaches the Brahmaputra, very often causing floods in the alluvial plains of Assam during the monsoon. Because of the earthquake of 1950, the bed of the Brahmaputra was silted up a few meters. This results in frequent spilling of the flood water over the Assam plains. The discharge hydrographs of the Brahmaputra show a very close relation to the rate of precipitation. Recent construction of embankments along the major tributaries of the Brahmaputra helped to enhance discharge and velocity of flow of water along these tributaries. (Knapp-USGS)
W71-08096

A BASIC HYDROLOGIC FORECAST OF THE DISTRIBUTION OF RUNOFF FROM MOUNTAIN RIVERS DURING A GROWING SEASON (RUSSIAN: FONOVYY PROGNOZ RASPREDELENIYA STOKA GORNYKH REK V VEGETATSIONNYY PERIOD),
Moscow State Univ. (USSR).
A. N. Vazhnov.
Meteorologiya i Gidrologiya, No 12, p 59-64, Dec 1970. 6 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Runoff forecasting, *River forecasting, *Runoff coefficient, *Hydrologic data, Distribution patterns, Seasonal, Air circulation, Watersheds (Basins).
Identifiers: *USSR, Caucasus, Runoff distribution.

The forecast of monthly distribution of runoff during the warm season, April through September, is of great value to the irrigation farming regions. To describe the monthly distribution of runoff, the ratio of the runoff during winter high water to the runoff of the following warm period is used. A continuity of atmospheric processes between spring and the preceding winter is assumed in establishing a relationship between variations in runoff distribution within a growing season and the character of atmospheric circulation. Annual values of atmospheric circulation from November through March are expressed as a percentage of the number of days in this five-month period. Given the number of days with meridional and western circulation, one can determine the extent to which the distribution of runoff during a growing season will deviate

from the average distribution for all rivers in question. A basic hydrologic forecast of total runoff for a growing season will also make it possible to obtain absolute monthly runoff values for specific rivers. For developing the forecast, studies were conducted on the Terek River basin at which 15 partial basins with runoff values for a 25-year period (1939-1941 and 1945-1966) were identified. (Josefson-USGS)
W71-08100

EFFECT OF FLAT BOG DRAINAGE ON THE RUNOFF REGIME OF SPRING HIGH WATER AND SUMMER FLOODS (RUSSIAN: VLIYANIYE OSUSHENIYA NIZINNYKH BOLOT NA REZHIM STOKA VESENNEGO POLOVOD'YA I LETNIKH PAVODKOV),
Ministry of Land Reclamation and Water Economics, Minsk (USSR).
For primary bibliographic entry see Field 04A.
W71-08103

SELECTED WATER RESOURCE RECORDS FOR OKALOOSA COUNTY AND ADJACENT AREAS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W71-08114

LOW-FLOW FREQUENCY OF WISCONSIN STREAMS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08115

SELECTED FLOW CHARACTERISTICS OF FLORIDA STREAMS AND CANALS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W71-08119

EFFECTS OF CHANNEL CHARACTERISTICS ON TIME PARAMETERS FOR SMALL WATERSHED RUNOFF HYDROGRAPHS,
Minnesota Univ., Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 02A.
W71-08121

RANDOM-WALK MODEL OF STREAM NETWORK DEVELOPMENT,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 07A.
W71-08190

2F. Groundwater

USE OF LINEAR PROGRAMING FOR ESTIMATING GEOHYDROLOGIC PARAMETERS OF GROUNDWATER BASINS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
For primary bibliographic entry see Field 06A.
W71-07704

LEACHING OF NUTRIENTS BY DRAINAGE WATERS,
Litovskaya Selskokhozyaistvennaya Akademiya SSR, Kaunas.
For primary bibliographic entry see Field 05B.
W71-07887

OPTIMAL USE OF COUPLED LEAKY AQUIFERS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 04B.
W71-07916

GEOLOGY AND GROUNDWATER RESOURCES OF ELLSWORTH COUNTY, CENTRAL KANSAS,
Kansas State Geological Survey, Lawrence.
Charles K. Bayne, Paul C. Franks, and William Ives, Jr.
Kansas Geological Survey Bulletin 201, Mar 1971. 84 p, 26 fig, 2 plate, 6 tab, 108 ref.

Descriptors: *Kansas, *Water resources development, *Glacial drift, *Aquifers, *Artesian wells, Water wells, Data collections, Hydrologic data, Hydrology, Groundwater recharge, Natural recharge, Subsurface waters, Porosity, Porous media, Soil water, Underground storage, Water wells, Springs, Mineral water.
Identifiers: *Ellsworth County (Kans), *Kansas River, *Kansas River basin.

Ellsworth County comprises an area of about 720 square miles. The county lies in the Dissected High Plains section of the Great Plains physiographic province and is drained by the Smoky Hill River and its tributaries and tributaries of the Saline and Arkansas Rivers. The topography slopes generally eastward. The long-term mean precipitation at Ellsworth, the county seat, is 25.66 inches. The Dakota Formation and the Pleistocene deposits in the valleys are the most important aquifers in the county. The lithology most characteristic of the Dakota Formation is gray and greenish-gray siltstone and clay showing red and reddish-brown mottles. These groundwater reservoirs are recharged principally from local precipitation. Yields of properly constructed wells may be in excess of 250 gallons per minute in the most productive areas. The results of chemical analyses indicate that the water generally is suitable for most uses; however, the quality varies considerably from place to place, and locally a large amount of chloride is present. An appendix is included which contains a record of 311 wells and springs located within the county in addition to the well logs of 117 test holes. (Glasby-USGS)
W71-07920

DRILLING TEST HOLES FOR IRRIGATION WELLS.
For primary bibliographic entry see Field 04B.
W71-07922

GROUNDWATER FOR IRRIGATION NEAR LAKE EMILY, POPE COUNTY, WEST-CENTRAL MINNESOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W71-07923

GROUNDWATER HYDROLOGY OF THE MESCALERO APACHE INDIAN RESERVATION, SOUTH-CENTRAL NEW MEXICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07927

GROUNDWATER RESOURCES OF WALSH COUNTY, NORTHEASTERN NORTH DAKOTA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07928

WATER-RESOURCES RECONNAISSANCE OF A PART OF THE MATANUSKA-SUSITNA BOROUGH, ALASKA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-07930

GROUNDWATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07937

SALINE GROUND-WATERS IN THE CA BONIFEROUS ROCKS OF THE ENGLISH EA MIDLANDS IN RELATION TO THE GEOLOG
Water Resources Board, Reading (England); a
British Petroleum Co., Ltd., London (England).
Richard Allen Dowing, and Frank Howitt.
Quarterly Journal of Engineering Geology, Vo No 4, p 241-269, June 30, 1969. 29 p, 12 fig, 3 t 25 ref, append.

Descriptors: *Hydrogeology, *Groundwater, *C bonate rocks, *Salinity, *Drill holes, Oil indus Water quality, Limestones, Aquifers, Aqu characteristics, Chlorides, Sampling, Chem analysis, Data collections.
Identifiers: *England (East Midlands).

The Carboniferous system in the East Midland England is comprised of a limestone-shale serie a massive limestone (the Carbonifer Limestone) overlain by a cyclic sequence of sa stones, mudstones, seat-earths and coals (the M stone Grit and Coal Measures). The geolog described briefly and modifications are made correlations of the Millstone Grit and Lower C Measures from information obtained by d drilling for oil. Most of the Carboniferous grou waters discussed are saline with total concen tions up to 246,000 mg/l. The concentration i formations increases from the Eakring-Kel Hills area towards Gainsborough, that is from s ne, and the variation in ionic content associ with this increase is discussed. The groundwa are believed to have originated from the diagen of Carboniferous marine and brackish waters possible some Permian marine waters. They probably been concentrated by argillaceous acting as semipermeable membranes and the crease in the Ca/Cl and Mg/Cl ratios as the ionic concentaration increases is probably du the selective concentration of calcium and m nesium ions by argillaceous beds. In the south and south of the East Midlands the saline wate been diluted, probably by meteoric water mo through the aquifers from the outcrop areas discharging into Permo-Triassic rocks, where t overlie Carboniferous aquifers at depth in southeast of the region. (Woodard-USGS)
W71-07965

RELATION OF FRACTURE TRACES, JOI AND GROUNDWATER OCCURRENCE IN AREA OF THE BRYANTSVILLE QUADR GLE, CENTRAL KENTUCKY,
Kentucky Univ., Lexington. Dept. of Geology.
George T. Hine.
Kentucky Geological Survey Thesis Series 3, I 27 p, 21 fig, 16 ref.

Descriptors: *Karst, *Kentucky, *Frac (Geology), *Joints (Geology), Limest Hydrogeology, Groundwater movement, W supply, Water resources development, Re sensing, Aerial photography, Mapping, Survey
Identifiers: *Bryantsville (Ky).

Fracture traces (natural linear features visib aerial photographs), joints, and groundwate currence were studied in detail in a limestone of approximately 48 square miles in the Inner Grass region of Kentucky. Twenty-four hun fracture traces, several hundred joints, and merous wells and springs were related. Fra traces exhibit orientation patterns similar to patterns and form as the result of the enlarge of joints by groundwater solution. Springs u occur along fracture traces, and wells drilled fracture traces encounter solution openin depth. Most subsurface water movement i area is probably along vertical fractures, joints or faults. (Knapp-USGS)
W71-08077

GEOHYDROLOGICAL SET-UP OF EAST INDIA,
Geological Survey of India, Calcutta.
Amit Kumar Roy.

an Geohydrology, Vol 5, No 1, p 65-70, Dec
9. 6 p.

criptors: *Hydrogeology, *Aquifers, *Water
urces, Reviews, Surveys, Aquifer charac-
tics, Water resources development, Water
ly, Alluvium, Sedimentary rocks, Igneous
s, Metamorphic rocks, Geology, Climates,
ndwater, Water levels, Water yield.
tifiers: India.

ydrologically, Eastern India can be divided
three units, namely, (1) areas covered by con-
ated formations, (2) areas covered by semi-
olidated formations and (3) areas covered by
nsolidated formations. Major parts of Bihar,
a, Assam and western parts of West Bengal
overed by consolidated and semi-consolidated
s like gneisses, schists, granulites, granites,
ros, basaltic traps, and sedimentary rocks of
hyan, Gondwana and Tertiary age. Uncon-
ated formations of Quartarnary age cover
of Bihar, Orissa, Assam and major parts of
Bengal and form the main repository of
ndwater in the region. Groundwater condi-
in the areas covered by the unconsolidated
ations are discussed under (a) alluvial tracts of
r, (b) alluvial tracts of West Bengal, (c) Brah-
utra valley of Assam, (d) coastal tract of Orissa
(e) areas covered by the unconsolidated and
ly consolidated sediments in Manipur Valley
Tripura. (Knapp-USGS)
-08097

**LOGY AND GROUNDWATER CONDI-
NS OF THE ALLUVIAL TRACT, EAST OF
GAPUR, BURDWAN DISTRICT, WEST
GAL - A PRELIMINARY STUDY,**
ogical Survey of India, Calcutta.
s, and A. B. Biswas.
n Geohydrology, Vol 5, No 1, p 71-89, Dec
. 19 p, 4 fig, 1 tab, 3 ref.

riptors: *Hydrogeology, *Hydrologic data,
ifers, *Aquifer characteristics, *Water
rces development, Alluvium, Sands, Water ta-
Artesian wells, Water yield, Water supply,
down.
tifiers: *India, Bengal (India).

nt exploratory drilling in the alluvial areas,
of Durgapur, India, revealed the occurrence of
nsolidated sediments ranging in age from Mid-
Cretaceous to Pleistocene, overlying a semicon-
ated basement of the Lower and Upper Gond-
s. These sediments increase in thickness from
in the west to more than 177 m in the east.
sand and pebble zones belonging to the Kul-
Alinager and Bishtupur formations constitute
promising aquifers in the area. Groundwater
rs under water-table conditions in the shallow
ers and under semiconfined to confined con-
ns in the deeper aquifers. The depths to water
below landsurface range from 2 to 4 m in
r and 3 to 8 m in summer. Production wells al-
y in operation in the area sustain a yield of
113 to 104,557 liters per hour with drawdowns
l to 7.1 meters. (Knapp-USGS)
-08098

**ES ON THE PLAINS - THE SAND HILLS
ION OF NEBRASKA,**
ogical Survey, Lincoln, Nebr.
Keech, and Ray Bentall.
raska University, Conservation and Survey
ion Resource Report No 4, Feb 1971. 18 p, 7
l ref.

riptors: *Water resources development,
braska, *Grasslands, *Dunes, *Land
rces, Groundwater, Water balance, Sands,
l development, Subhumid climates, Surface
rs, Water supply, Water yield.
tifiers: *Sand Hills (Nebr).

ar the largest sand-dune area in the Western
isphere, the Sand Hills region of Nebraska is more than 10 times larger than the State of Delaware and almost 3 times the size of Massachusetts. However, unlike other great sand-dune areas of the world, the Nebraska Sand Hills region is not a desert. Not only is its surface stabilized by a grass cover, but beneath it is a thick sequence of permeable rocks filled to overflowing with water. Hundreds of shallow lakes are present, and many streams having remarkably steady rates of flow rise within the region. There exists a considerable potential for additional developments of natural resources. The Ogallala aquifer which forms the High Plains surface, underlies the entire Sand Hills. Currently, the long-term average rate of replenishment is virtually equalled by the long-term average rate of natural discharge. Large quantities of groundwater could be pumped from wells in parts of the Sand Hills region without appreciably diminishing the flow of streams or the amount of water in storage there. Water now being lost to evapotranspiration could be salvaged by pumping. (Knapp-USGS)
W71-08112

SELECTED WATER RESOURCE RECORDS FOR OKALOOSA COUNTY AND ADJACENT AREAS,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W71-08114

LIMESTONE SOLUTION WITHIN THE EAST MENDIP AREA, SOMERSET,
Saskatchewan Univ., Regina. Dept. of Geography.
David Drew.
Cave Research Group of Great Britain Transactions, Vol 12, No 4, p 259-270, Dec 1970. 12 p, 8 fig, 2 tab, 22 ref.

Descriptors: *Underground streams, *Karst, *Limestones, *Dissolved solids, *Water chemistry, Chemical analysis, Caves, Springs, Water temperature, Flow rates, Surface waters, Hydrologic data, Data collections, Groundwater movement, Water quality, Streamflow.
Identifiers: *Sinking streams, *England, Streamflow characteristics.

Measurements of calcium and magnesium carbonate content, pH, saturated pH, temperature and discharge were made at a group of three major resurgences and their associated underground streams on the north flank of Beacon Hill, eastern Mendip, England, over a three-year period. Considerable variations in calcium carbonate content were found between individual sinking streams and between risings. These differences were reflected in temperature and Langelier Index differences. The effects of mixture corrosion and differential supply of carbon dioxide to the water are postulated as possible factors causing these variations. (Woodard-USGS)
W71-08116

AN ELEMENTARY STUDY OF THE CAVE MORPHOLOGY AND SEEPAGE IN THE REYFAD/POLLNACROM SYSTEM, NORTHERN IRELAND,
R. A. Halliwell.
Cave Research Group of Great Britain Transactions, Vol 12, No 4, p 271-281, Dec 1970. 11 p, 3 fig, 3 tab, 16 ref.

Descriptors: *Karst, *Caves, *Rainfall disposition, *Seepage, *Groundwater movement, Gravitational water, Flow rates, On-site investigations, Data collections, Water yield, Analytical techniques, Statistical methods, Rainfall.
Identifiers: *Northern Ireland, *Cave morphology.

Data were collected on cave seepage in County Fermanagh, Northern Ireland, July 1969. The work was done in two parts, a study of the cave morphology and a study of the hydrology. The latter concentrated on the precipitation and its relation to the seepage rates measured in the cave. The sampling points were locations at which water was dripping from the roof. The method of location of drip points was to stand still, listen, and then move towards the sound of the dripping. It was possible to locate a single drip point, identify it, and mark it with fluorescent paper quite speedily. The number of drips which fell in a five minute period was counted. Correlation coefficients between the drip rate values and the rainfall were calculated. The paper is intended to show how information to the caver can be produced from very elementary data collection by simple statistical analysis. (Woodard-USGS)
W71-08117

PRELIMINARY RESULTS OF AN APPLICATION OF THE PROCEDURE FOR THE MEASUREMENT OF AGGRESSIVENESS OF WATER TO CALCIUM CARBONATE,
R. Stenner.
Cave Research Group of Great Britain Transactions, Vol 12, No 4, p 283-289, Dec 1970. 7 p, 6 fig, 12 ref.

Descriptors: *Underground water, *Caves, *Limestones, *Water analysis, *Water chemistry, Chemical analysis, Analytical techniques, Hydrogeology, Geology, Rainfall, Temperature, Percolation, Percolating water, Hydrographs, Groundwater movement, Temporal distribution, Surface waters, Karst.
Identifiers: *England, *Cave hydrology, Sinking streams.

The usefulness of a procedure for the measurement of aggressiveness of water to calcium carbonate was investigated by incorporating it in a more comprehensive hydrological study in G. B. Cave, Somerset, England. In a study of the solution of limestone by the main stream, the important part played by boulder ruckles was shown. Temporal changes in potential total hardness were investigated in streams of underground water and percolation water; effects of precipitation and temperature were found to be negligible except in times of highly abnormal rainstorms, in which case delayed effects were found. Variations in aggressiveness of percolation water were studied in conjunction with hydrographs, giving new information concerning the mechanism of limestone solution in the Mendip Hills of Somerset. (Woodard-USGS)
W71-08118

2G. Water in Soils

PEDOLOGIC FEATURES OF RESERVOIR SEDIMENTATION,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 02H.
W71-07702

SOME TECHNIQUES FOR THE MEASUREMENT OF PLANT AND SOIL WATER POTENTIALS WITH THERMOCOUPLE PSYCHROMETERS,
Montana State Univ., Bozeman. Water Resources Research Center.
For primary bibliographic entry see Field 02I.
W71-07836

THE GEOCHEMISTRY OF SODA SOILS,
N. I. Bazilevich.
Available from the National Technical Information Service as TT-6955086, $3.00 in paper copy, $0.95 in microfiche. Jerusalem, Israel Program for Scientific Translations, 1970. 392 p. Trans. of Geokhimiya Pochv Sodovobo Zasoleniya, Moscow, 1965.
Identifiers: *Soda ash deposits, *Geochemistry, *Sodium carbonates, Geochemistry, *Soil chemistry, Soda ash deposits, *USSR, Soda ash deposits, Siberia, Salinity, Soil analysis, Groundwater, Trees, Plants, Surface water, Translations.

This monograph embodies an attempt at an analysis and synthesis of multifarious natural processes (geological, geomorphological, climatic, formation of subsurface and surface waters, interaction between plants and soils), along with their evaluation for man's practical activities. The plans for amelioration and development of new lands in the USSR call for a full and correct understanding of the nature of soil-geochemical processes. This monograph successfully combines a profound understanding of landscape genesis and geochemistry from a detailed elucidation of soil processes, effect of the plant cover on turnover of substances in soils, with the basic principles of practical recommendations for the cultivation of soda soils.
W71-07840

NATURAL LEACHING OF THE HIGHLY SALT AFFECTED SOILS OF WESTERN RAJASTHAN,
Public Health Engineering Lab., Jodhpur (India); Indian Grassland and Fodder Research Inst., Jhansi (India); and Central Arid Zone Research Inst., Jodhpur (India).
I. C. Gupta, and C. T. Abichandani.
Journal of Soil and Water Conservation in India, Vol 18, Nos 1 and 2, p 62-64, Jan-June 1970. 3 p, 4 tab, 5 ref.

Descriptors: *Saline soils, *Leaching, *Irrigation practices, Soil conservation, Soil management, Irrigation, Cultivation.
Identifiers: *India.

Saline groundwaters of salinity level 4 to 10 mmhos EC/cm occur widely in Western Rajasthan, India. Some of these are used for growing salt tolerant Kharchi wheat. Two rainy seasons of 250-400 mm rainfall serve to reclaim the soil, and no crop is taken during the rainy seasons because of capillary rise during the following hot season after the saline water irrigation is over. The highly saline sandy soil profile of medium depth became salt free with precipitation of about 10 cm in the cropping season of 1964-65 and supplemental irrigation with moderate saline water did not make the soils saline; there was no accumulation of soluble or exchangeable sodium in the root zone of the soil. (Knapp-USGS)
W71-08071

EROSION OF UTTAR PRADESH SOILS BY WATER AND ITS RELATION TO SOIL PROPERTIES,
Allahabad Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 02J.
W71-08074

NUMERICAL ANALYSIS OF FINITE DEPTH PROBLEMS IN SOIL-WATER HYDROLOGY,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
K. K. Watson.
Nordic Hydrology, Vol 2, No 1, p 1-22, 1971. 22 p, 14 fig, 10 ref.

Descriptors: *Unsaturated flow, *Infiltration, *Soil water movement, *Percolation, *Numerical analysis, Mathematical models, Water table, Recharge, Pit recharge, Water spreading, Sands, Porous media.
Identifiers: Soil water hydrology.

The types of initial and boundary conditions which may be involved in the flow of water through an unsaturated profile to a water table are discussed. A numerical solution of the flow equation is outlined for use in calculating the one-dimensional drainage of a homogeneous profile and of ponded infiltration. Numerical solutions are given for the drainage of a stratified profile and infiltration into a draining profile. (Knapp-USGS)
W71-08083

THE EFFECT OF HYDROPHOBIC SUBSTANCES ON WATER MOVEMENT IN SOIL DURING INFILTRATION,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
Leonard F. DeBano.
Soil Science Society of America Proceedings, Vol 35, No 2, p 340-343, Mar-Apr 1971. 4 p, 4 fig, 2 tab, 17 ref.

Descriptors: *Soil water movement, *Wettability, *Unsaturated flow, *Diffusion, *Infiltration, Permeability, Soil physical properties, Wetting, Diffusivity, Organic acids, Humic acids.
Identifiers: Water-repellent soils.

The effect of hydrophobic substances on soil water movement was studied by infiltrating water horizontally and vertically into soil columns packed with wettable and water repellent soils. Horizontal infiltration was 25 times slower in water repellent soil than wettable soil. In the water repellent soil, the water content decreased 20 to 25% between the water source and the wetting front. In contrast, water content dropped 10% in the same region of the wettable soil. Diffusivities calculated for the two types of soil suggested that hydrophobic substances had the greatest effect on water movement at the lower water contents. The orientation of the columns during water entry affected the shape of the soil-water profiles in the water repellent soil, but not in the wettable soil. The diffusivities calculated from horizontal infiltration experiments were not useful for predicting soil-water profiles during vertical infiltration into either the wettable or water repellent soils. (Knapp-USGS)
W71-08087

SOIL WETTABILITY IN UTAH JUNIPER STANDS,
Forest Service, Tempe, Ariz.
David G. Scholl.
Soil Science Society of America Proceedings, Vol 35, No 2, p 344-345, Mar-Apr 1971. 2 p, 1 fig, 1 tab, 11 ref.

Descriptors: *Soil water movement, *Wettability, *Unsaturated flow, *Diffusion, *Infiltration, Permeability, Soil physical properties, Wetting, Diffusivity, Organic acids, Humic acids.
Identifiers: Water-repellent soils.

Wettability varied widely between three ground-cover zones and three soil horizons in a Utah juniper stand. Resistance to wetting in the surface soil increased from completely wettable in open areas to highly nonwettable in the litter under the juniper canopy. Resistance to wetting decreased with depth in the soil profile below the litter zone and increased with increasing organic matter. Changes in the soil moisture level also influenced the wettability of the various zones and horizons. Wettability was determined at 1/3 and 15 bars moisture tension and air-dry, with the 15-bar level showing the greatest resistance to wetting. (Knapp-USGS)
W71-08088

THE SOIL WATER REGIME OF AN ARID GRASSLAND COMMUNITY IN CENTRAL AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Rangelands Research Unit.
R. E. Winkworth.
Agricultural Meteorology, Vol 7, No 5, p 387-399, Oct 1970. 4 fig, 14 ref.

Descriptors: *Arid lands, Soil water, Measurement, *Precipitation (Atmospheric), Evaporation, Percolation, Soil moisture, Equipment, Runoff, Foreign countries, Drying, Climatological data, Recharge.
Identifiers: *Australia, *Grassland.

A red-earth-soil arid tussock grassland in Australia was studied for precipitation recorded and soil moisture content over a two-year period. The mate is arid, with mild winters, and hot summ Most precipitation occurs during the summ with long dry periods separating times of rain After rain, soil wetting was rapid down to about cm. Depletion of soil moisture began about weeks after precipitation, and soil moist remained low until the next rainfall. Periods available soil water ranged from 25 to 141 d Surface runoff always accompanied precipitat Soil water storage was measured by gypsum-bl conductivity. Results were affected by errors in soil and insensitivity of drying soil. 632 mm precipitation were recorded during the study which about 52 percent recharged the soil and percent was directly evaporated. (Yen Arizona)
W71-08142

RECLAMATION OF SALINE-SODIC SOILS THE UPPER COLORADO RIVER BASIN,
Colorado State Univ., Experiment Station, Gr Junction.
For primary bibliographic entry see Field 03C.
W71-08146

2H. Lakes

PEDOLOGIC FEATURES OF RESERV SEDIMENTATION,
Purdue Univ., Lafayette, Ind. Water Resou Research Center.
Helmut Kohnke, Manuel Paulet, and L. J. Lund
Available from the National Technical Informa Service as PB-198 806, $3.00 in paper copy, $ in microfiche. Indiana Water Resources Rese Center Technical Report No 18, Apr 1971. 41 fig, 3 tab, 39 ref. OWRR Project B-0113-IND (

Descriptors: *Sedimentation, *Reservoir silt *Sedimentation rates, Sediment transport, *S ment distribution, Bottom sediments, Clays, P cle shape, *Particle size, Sands, Silts, Watersh Mineralogy, Petrology.

The purpose of the research was to deter quantitatively the extent soil characteristics o contributing watershed influenced the rate type of sedimentation in a reservoir. The study made on fourteen reservoir - watershed comb tions in Indiana and Illinois. Particle size cha teristics of soils and sediments were shown t most significant in relating watershed cha teristics to reservoir sediment properties and ment rates. Under the conditions of the study, finer the texture of the soils of the watershed the more uniform their particle size, the gr were the sedimentation rates. Particle size ana of the sediments was also helpful in distinguis recent sediments from original bottom materia the reservoir. The amounts of mica, vermicu kaolinite and amorphous alumina found in the fraction of sediments related well to that foun the contributing soils. Very little quartz was fo in the sediment, it apparently being lost in t porting. No consistent variation was found betw the clay mineralogy of the sediments and pos within a reservoir. The clay mineralogy of the in the watersheds could not be identified as ha a direct effect on the sedimentation rates o reservoirs. (Wiersma-Purdue)
W71-07702

EFFECTS ON LAKE PONTCHARTRAIN, OF HURRICANE SURGE CONTROL STR TURES AND MISSISSIPPI RIVER-GULF O LET CHANNEL,
Army Engineer Waterways Experiment Sta Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07791

INSTRUMENTATION FOR MEASUR PHYSICAL PROPERTIES OF A LAKE,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.

mar H. Bock.
E Transactions on Geoscience Electronics, Vol -8, No 1, p 46-59, 1970. 16 fig, 8 ref.

criptors: *Thermal water, *Temperature, ow rates, Instrumentation, Measurement, verplants, Nuclear powerplants, Data transmis-n, Telemetry, Currents (Water), New York.
ntifiers: *Cayuga Lake (NY), Digital-to-analog verter.

device for recording temperature profiles and rate of water was developed and installed at eral points in Cayuga Lake, (NY), in connec- with the projected construction of a nuclear-ed power plant. The recording instruments, nted on buoys, are connected to shore by ns of coaxial cable which transmits by audio s frequency the variables being recorded. Time sion multiplex is used for sampling signals. At shore the data are recorded in digital or analog nal. The output of a digital-to-analog converter ects a paper chart recorder for monitoring pur-s. Connection of the signals to a Bell phone voice quality line permits a remote ac-to the data. (Wilde-Wisconsin)
-07882

RESEARCH OF HUMIC SUBSTANCES IN ONIAN LAKES (IN GERMAN),
demiya Nauk Estonskoi SSR, Tartu. Inst. of logy and Botany.
primary bibliographic entry see Field 05C.
-07883

RIENT SUPPLY AND PRIMARY PRODUC-N IN CLEAR LAKE, EASTERN ONTARIO,
t Univ., Peterborough (Ontario).
primary bibliographic entry see Field 05B.
-07890

NIUM-234 AND URANIUM-238 IN THE TERS AND BOTTOM SEDIMENTS OF E BALKHASH AND THE AGE OF THE E,
demiya Nauk Kirghiz SSR, Frunze. Inst of ics and Mathematics.
Chalov, N. A. Suetlichnaya, and T. V. Tuzova.
slated from Geokhimiya, No 7, 1970. chemistry International, Vol 7, No 4, p 604-1970. 7 p, 6 tab, 25 ref.

riptors: *Radioactive dating, *Lakes, *Bottom nents, Salts, Uranium radioisotopes, chemistry, Radioactivity techniques, Stratig-y, Water chemistry.
tifiers: Lake Balkhas (USSR).

U-234: U-238 composition of the bottom sedi-s and water of Lake Balkhash, USSR, was in-gated by alpha-particle spectrometry. The age e lake (37 plus or minus 7 thousand years) rmined from radioactive disequilibrium agrees geological evidence. These ages are substan- different from the ages calculated from the f accumulation of salts. Calculation of the age es without outlets from the rate of accumula-f salts gives results conflicting with geological rvations not only for Lake Balkhash but also e Sea of Aral. (Knapp-USGS)
-07944

MATION CONDITIONS OF SULPHUR-RING MUDS IN CURRENT CRATER ES,
Inst. for Mined Chemical Raw Material, Lyu-y, (USSR); and Akademiya Nauk SSSR, ow. Institut Geokhimii i Analiticheskoi ii.
u. Lein, V. A. Grinenko, and M. V. Ivanov.
slated from Geokhimiya, No 8, 1970. hemistry International, Vol 7, No 4, p 664-1970. 9 p, 6 fig, 5 tab, 16 ref.

riptors: *Water chemistry, *Craters, *Lakes, canoes, *Sulfur, Sulfur compounds, Sedimentation, Chemical precipitation, Mineralogy, Geochemistry, Gases, Bottom sediments.
Identifiers: *USSR.

Chemical sedimentation is the principal process producing sulfur-bearing muds in acid crater lakes; it produces thin-bedded sediments consisting of native sulfur (25-55%), opal, alunite, and clay minerals. Iron sulfides are produced at the mud-water interface or by diagenesis of the muds. The S-34 content of the native sulfur and sulfides lie within the limits characteristic of volcanic H2S. Three main factors control sedimentation in new crater lakes: (1) rapid influx of sulfur-bearing gases from bottom fumaroles, (2) high corrosiveness of the very acid water, (3) influx of clastic and pyroclastic material. The rates of accumulation of sulfur in crater lakes are greater than those under the conditions of ordinary sedimentation by factrs greater than 100. For instance, the sulfur muds of Lake Goryacheye (Ebeko volcano), USSR, produce about 48 kg of sulfur per cum in a year. (Knapp-USGS)
W71-07945

ON BIOLOGICAL NITROGEN FIXATION IN NATURE, PARTICULARLY IN BLUE-GREEN ALGAE,
Carlsberg Laboratoriet, Copenhagen (Denmark).
Carsten Olsen.
Comptes Rendus des Travaux du Laboratoire Carlsberg, Vol 37, No 12, p 269-283, 1970. 6 tab, 19 ref.

Descriptors: *Nitrogen fixing bacteria, *Nitrogen fixation, *Cyanophyta, Nitrogen, Hydrogen ion concentration, Iron, Swamps, Manganese, Water quality control, Ions, Anaerobic conditions, Mud, Sands, Calcium, Symbiosis, Molybdenum, Cobalt, Lakes, Boron, Sodium, Potassium, Phosphates, Submerged plants, Legumes, Oceans, Laboratory tests.
Identifiers: Azolla, Anabaena, Azolla caroliniana, Denmark, Azolla filicoides, Zinc, Azolla pinnata, Lemna, Ferric ions, Azolla nilotica, Trichodesmium thiebautii, Sargasso Sea, Caribbean Sea.

When Azolla caroliniana, which lives in symbiosis with the blue-green alga, Anabaena azolla, is transplanted into certain types of small Danish lakes, it can spread forming a thick blanket covering the entire water surface, and can fix up to 95 kg of nitrogen per hectare in one summer. Azolla caroliniana only thrives in small lakes and other water areas where the water is usually more or less brownish, has a pH value around 6 to 7, and contains ferrous ions or complex iron-humus compounds and manganous ions in suitable concentrations. Molybdenum and cobalt are also necessary, although in very small quantities, for Azolla to attain maximum rate of fixation. The presence of ferrous ions is due to anaerobic processes in the mud layer whereby ferrous sulfide is formed. In lakes with sandy bottoms without mud and with clear, colourless water with pH values from 7 to 8 and a large calcium content (about 50 mg/l), iron occurs only as ferric ions, and in such lakes, Azolla will not develop. The plants grow chlorotic and gradually perish due to iron deficiency. Four species of Azolla are mentioned with world distribution. (Jones-Wisconsin)
W71-08024

MICROFLORA OF CHLORELLA K DURING A PROLONGED CULTIVATION OF THE ALGAE IN A PERFUSION UNIT WITH A CONTINUAL RECYCLING OF THE CULTURE MEDIUM, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
For primary bibliographic entry see Field 05C.
W71-08027

FOOD NICHE AND CO-EXISTENCE IN LAKE-DWELLING TRICLADS,
North Wales Univ. College, Bangor (United Kingdom). Dept. of Zoology; and University Coll. of North Wales, Bangor. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W71-08033

CENTRARCHID FOOD HABITS IN A NEW AND OLD RESERVOIR DURING AND FOLLOWING BASS SPAWNING,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark.
James W. Mullan, and Richard L. Applegate.
Proceedings of the 21st Annual Conference of the Southern Association of Game and Fish Commissioners, p 332-342, 1967. 5 fig, 2 tab, 11 ref.

Descriptors: *Spawning, *Fish, *Reservoirs, Fish diets, Food habits, Predation, Bass, Populations, Sunfishes.
Identifiers: *Centrarchidae, Bull Shoals Reservoir (Ark-Mo), Beaver Reservoir (Ark-Mo), New impoundments, Old impoundments, Sunfish, Bluegill.

Examinations were made of the stomach's contents of sunfish, bluegill, and largemouth, smallmouth, and spotted bass inhabiting a 15-year old reservoir and a reservoir in the process of filling. The study was conducted during and following bass spawning. The results suggested that the new basin contained an adequate supply of food to sustain the centrarchid population. The opposite was true of the old reservoir; its large fish consumed the tendipedids and cladocerans, as well as some eggs and young of bass. The newly hatched largemouth bass were dependent on left-overs of small prey. (Wilde-Wisconsin)
W71-08035

THE COPEPODA AND CLADOCERA OF A MISSOURI RIVER RESERVOIR: A COMPARISON OF SAMPLING IN THE RESERVOIR AND THE DISCHARGE,
Bureau of Sport Fisheries and Wildlife, Yankton, S.D.
For primary bibliographic entry see Field 05C.
W71-08036

THE 1963-64 LAKE MEAD SURVEY,
Bureau of Reclamation, Denver, Colo. Office of Chief Engineer.
For primary bibliographic entry see Field 04A.
W71-08051

CONCENTRATIONS OF POLLUTANTS IN AGRICULTURAL RUNOFF,
Texas Tech. Univ., Lubbock. Dept. of Civil Engineering; and Texas Tech. Univ., Lubbock. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W71-08053

EVALUATION OF THE WATER BALANCE OF AN INTERCONNECTED GROUP OF LAKES AS ILLUSTRATED BY THE GREAT MASURIAN LAKES,
State Inst. of Hydrology and Meteorology, Warsaw (Poland).
Zdzislaw Mikulski.
Geographia Polonica, No 14, p 165-173, 1968. 9 p, 3 fig, 1 tab.

Descriptors: *Water balance, *Lakes, Storage capacity, Precipitation (Atmospheric), Evaporation, Runoff, Water storage, Inflow, Discharge (Water), Hydrologic data.
Identifiers: *Poland, Great Masurian Lakes, Lake storage, Water exchange, Water divide.

An attempt is made to work out the water balance of a group of interconnected lakes forming one hydrographic system. The Great Masurian Lakes located in the region of the Masurian Lake District

of northwest Poland are used as an example. Lakes of the Great Masurian Lake group located in the vicinity of the water divide show a relatively low water exchange, while the small transit lakes lying some distance from the divide have an intense water exchange. The range of fluctuations for the small lakes is vast--from several percent to well over three hundred. The annual water exchange in the northern part of the lake group amounts to 110 million cu m, so that with a lake storage capacity of over 1,000 million cu m the exchange rate is about 10%. The southern part of the lake group carries off almost five times more water than the northern part so that, with a storage capacity of approximately 1,600 million cu m, nearly one third of the water is exchanged in the course of a year. The entire group of Great Masurian Lakes exchanges annually about 40% of its waters, so that full exchange of waters theoretically takes place within about 2 1/2 years. A water layer of approximately 2.60 m thickness per year undergoes exchange. A tentative assessment of the water balance presented may provide an approach to developing water balance methods for interconnected lake groups. (Josefson-USGS)
W71-08111

A PROSPECT OF LAKE KARIBA,
University Coll. of Rhodesia, Salisbury.
Alan Bowmaker.
Optima, Vol 20, No 2, p 68-74, June 1970. 7 fig, 1 tab.

Descriptors: Limnology, *Ecology, *Productivity, *Biological communities, *Vegetation effects, Thermocline, Thermal stratification, Epilimnion, Hypolimnion, Environmental effects, Life cycles, Aquatic populations, Physicochemical properties, Littoral, Fish diet, Fish establishment, Fish populations, Water level fluctuations, Water hyacinth, Nutrients, Tropical regions, Habitats, Ecosystems.
Identifiers: *Lake Kariba, *Rodesia, *Plant pests, *Littoral hydrophytes.

When first created, Lake Kariba, in Rhodesia was the largest man-made lake in the world. The lake attracted a massive and famous international effort to rescue wildlife trapped by the rising waters. This effort was largely meaningless because no suitable alternative habitat was available for large mammals. Before it's creation, only cursory ecological studies were made, and this shortsight, together with a generally low level of knowledge concerning phenomena associated with the creation of lakes in tropical regions, have been reflected in the development of unforeseen problems and many errors in productivity predictions. However, unforeseen benefits have also occurred. The unseasonal flooding effects down river, caused by the lake, have endangered a considerable amount of crucial wildlife habitat. In the lake itself, thermal stratification has developed, resulting in a gradual increase in colonization space but decreases in productivity and nutrient levels after a large initial increase. Evidence indicates that nutrient levels may soon gradually increase again. A massive mat of Salvinia developed on the surface, giving rise to much anxiety and many studies on its control. Water level fluctuations have had a critical effect on productivity, since they have kept littoral hydrophytes very low and disturbed the young of some fish populations. The author feels that Salvinia may actually be beneficial since annual changes in lake volume are as much as one-third, and this would have lead to great nutrient losses if they had not been locked up in Salvinia. Introduction of Tilapia macrochir seems to have been ill-conceived, but several important species not present in the pre-impoundment era have appeared. Future projects will require much more understanding between the biologist and engineer. (Casey-Arizona)
W71-08141

FERN LAKE MINERAL METABOLISM PROGRAM,
Washington Univ., Seattle. Coll. of Fisheries.
Lauren R. Donaldson.
Available from the National Technical Information Service as RLO 2225-T-7-3, $3.00 in paper copy, $0.95 in microfiche. Annual Progress Report, June 16, 1970.

Descriptors: *Lakes, *Food chains, *Fishes, Algae, Plankton.
Identifiers: Mineral metabolism, *Fresh water biology, Ecology, Plankton, Fern Lake.

This past year the studies at Fern Lake have produced challenging and, in some cases, contrasting results with previous years. Fertilization was initiated in mid-June and was continued at weekly intervals for a ten-week period. The slow response of the primary producers was significant and the later dominance of a blue-green alga, Anabaena sp., had consequences that resulted in some undesirable effects, particularly to the zooplankton. Insect emergence responded favorably to the enrichment, especially in the spring of 1970, when emergence records for the ooze area were the highest ever recorded for the lake. The rainbow-steelhead trout hybrids planted in the lake this year, although showing abnormally poor growth during the fall and winter because of the low zooplankton population, produced phenomenal growth as the spring midge emerged. The growth data were almost twice that of any other year. The maximum size of the trout was 270 g, compared to previous highs of 100 g. In May of 1970, sockeye salmon were planted in the lake. This species is a plankton-feeder and will provide an opportunity to compare the production and behavioral characteristics of this fish with those of the steelhead trout.
W71-08175

A STOCHASTIC APPROACH TO THE DEVELOPMENT OF A REGULATION PLAN FOR THE GREAT LAKES,
Department of Energy, Mines and Resources, Ottawa (Ontario); and McGill Univ., Montrel (Quebec).
For primary bibliographic entry see Field 06B.
W71-08267

TEMPERATURE VARIATIONS IN A WATER RESERVOIR,
A. G. Kolesnikov.
Trans. from Doklady Akademii Nauk SSSR, Vol. 92, No 1, 1953. Available from the National Technical Information Service as AD-715 028, $3.00 paper copy, $0.95 microfiche. Cold regions Research and Engineering Lab., Hanover, N.H. Translation, 1970. 7 p.

Descriptors: *Ice, *Reservoirs, *Winter, *Heat transfer, *Mathematical models, Heat budget.
Identifiers: *Ice cover, *Temperature variations, *Ground heat reserves, Temperature distribution.

The heat regime of reservoirs is usually reported on the basis of summer season investigations and there are virtually no studies of the winter heat regime of waters. The author proposes a solution to the problem of the formation of the temperature variations of water in a reservoir in the winter season during ice cover conditions. The derived equation consists of three terms. The first characterizes the stationary distribution of temperatures; the second term reflects the changes caused by the deviation of the initial distribution of water temperature at the time of formation of a continuous ice cover from a stationary value. The third term is of the greatest interest. It shows how the water temperature increases under the ice with its heating by the heat reserves contained in the ground. (Oleszkiewicz-Vanderbilt)
W71-08320

2I. Water in Plants

EFFECT OF WATER AVAILABILITY ON PHOTOSYNTHESIS OF PLANTS,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 03F.
W71-07703

CARBON DIOXIDE AND WATER VAPOU EXCHANGE IN ATRIPLEX LEAVES,
Australian National Univ., Canberra. Researc School of Biological Sciences.
For primary bibliographic entry see Field 02D.
W71-07808

STOMATA AND CUTICULAR SURFACES O PINUS RADIATA NEEDLES AS SEEN WITH SCANNING ELECTRON MICROSCOPE,
Duke Univ., Durham, N.C.
D. A. Rook, H. Hellmers, and J. D. Hesketh.
NSF Grant GB-7153. Journal of the Arizo Academy of Sciences, Vol 6, No 3, p 222-225, F 1971. 7 fig, 5 ref.

Descriptors: *Electron microscopy, *Pine tre *Leaves, *Stomata, *Cuticles, Moisture stre Temperature, Plant morphology, Laboratory tes Laboratory equipment.
Identifiers: *Monterey Pine, *Wax cuticles.

Since no drastic prestudy treatment is necessar plant anatomy studies with the scanning electr microscope have the advantage of relatively fre plant material. Two groups of Pinus radia seedlings were examined. One group was gro from New Zealand breeding program seed and t other from seed of a native California stand. T New Zealand seedlings were grown under differi moisture regimes, being watered either daily once every 2 weeks. The California seedlings we subjected to differing temperature regimes, so of which were near the hot and cold limits growth. Primary and secondary needles were th examined with the scanning electron microsco for differences in stomatal and waxy cuticul morphology. The secondary needle surfaces a ridged with numerous tubular outgrowths from st mata arising from a relatively smooth wax layer. contrast, the cuticular surfaces of the primary ne dles and cotyledons were covered with wax flak No differences were observed in surface topo raphy between drought conditions or growing te perature in any of the groups. (Casey-Arizona)
W71-07811

ANIMAL UTILIZATION,
Khartoum Univ. (Sudan). Dept. of Zoology; a Sudan Natural History Museum, Khartoum (S dan).
J. L. Cloudsley-Thompson.
In: Arid Lands In Transition, p 57-72, Pub No 9 AAAS, 1970. 7 fig, 24 ref.

Descriptors: *Arid lands, *Xerophilic anima *Grazing, *Herbivores, *Social aspects, Anim behavior, Water users, Dams, Ecology, Wat balance, Water shortage, Goats, Cattle, Fo habits, Ecosystems, Land uses, Deferred co Water quality, Productivity, Human populatio Political aspects, Irrigation effects.
Identifiers: *Sahara Desert, *Nomads, *Develo ing nations, *Camels, *Ostriches.

The major resource of desert areas is an inexhaus ble supply of solar energy. While many desert r gions may be made to bloom with water applic tions, the major water supply, groundwater, is e tremely variable in quality and prospects for utilization in most desert regions are far from e couraging. The potentialities of animal science areas, particularly the Sahara Desert, where wa is unavailable for irrigation, are reviewed. Man's e fects on the deserts have been primarily destru tive, particularly through overgrazing, so th deserts of low productivity have expanded in larger deserts of virtually zero productivity. In t Sahara, goats increase productivity, but contribu further to ecological degradation. Increasing wate hole distribution should increase herbivore grazi ranges, but this is of limited practicality. The cu rent policies of various governments leading to pe manent settlement of nomads is probably ill-co ceived, since in many areas, nomadism is the on possible form of desert exploitation. Desert irrig tion projects lead to critical medical entomologic problems such as malaria, trachoma, amoeb

ary and bilharziasis. They also encourage locusts, which may be self-defeating in terms anding crop production. Possible grazing which may enhance animal production are ered, and the major possibilities appear to be mel and the ostrich. Human food habits ly seem to preclude the camel. Inadequate rity with desert ecology is resulting in a of questionable development schemes that ing only to expand the desert. Additionally, ccount must be taken of cultural peculiari- ich may also serve to defeat many projects. -Arizona)
7815

SEED PRODUCTION IN YUMA COUN-

tural Research Service, Tucson, Ariz.
nary bibliographic entry see Field 03F.
818

T IRRIGATION AFFECTS FLOUR AND QUALITY,
Univ., Tucson; and Arizona Agricultural ent Station, Tucson.
ary bibliographic entry see Field 03F.
819

IZATION OF IONS IN THE HYLL CELLS OF THE SUCCULENT HYTE SUAEDA MONOICA FORSSK. AY MICROANALYSIS,
Univ. (Israel). Dept. of Botany.
el, and A. Eshel.
tia, Vol 27, No 2, p 230-232, 1971. 2 fig,

ors: *Halophytes, Ions, *X-ray analysis, lance, *Plant physiology, Laboratory tests, Potassium, Chlorides, Phosphorus, Sodium chloride.
rs: *Vacuoles, *Cytoplasm, Seepweed.

Suaeda monoica, a halophyte, were grown culture on a half-strength Hoagland's solu- y mM NaCl were added to half the plants eks later cotyledons and leaves were taken sis. Na, K, p and Cl were determined by X- onalysis. In NaCl-treated plants, most of nd located within the cytoplasm, with very ted within the vacuoles. Cl levels were low ly distributed. Vacuolar P was negligible. efficient plants (grown under non-saline s), K was distributed throughout the cells, rred in greater quantity in the vacuoles. It substitute for Na. P occurred in both n and vacuoles. Although the experimen- d does not yet permit exact quantitative uation, the resolution obtained still per- gross distinction between 2 major cell nents. It is concluded, that, contrary to theories concerning halophyte salt , the mesophyll cells of Suaeda absorb n high quantities of Na in the cytoplasm n reject it. Probably the Na is utilized in ytoplasmic growth mechanisms. (Casey-

20

FECT OF WATER POTENTIAL ON ARBON DIOXIDE COMPENSATION OF MAIZE AND SUNFLOWER LEAF

Univ. (Israel). Dept. of Botany.
and M. Y. Katchansky.
rnal of Botany, Vol 19, No 4, p 535-541, g, 3 tab, 18 ref.

rs: *Carbon dioxide, *Leaves, nthesis, *Dehydration, *Hydrostatic pres- es of action, Osmotic pressure, Stomata, iology, Laboratory tests, Turgidity.
: *Carbon dioxide compensation point, otential, *Relative water content.

The carbon dioxide compensation point, established at constant light and temperature values, expresses the state of balance between absorbing and releasing carbon dioxide processes in a leaf system under given conditions. Its experimental significance is in the elimination of the stomatal resistance factor. Sunflower and maize leaf segments were saturated in water, partially dried, and relative water content (RWC) was determined by weighing Tissue water potentials and osmotic potentials were determined under varying conditions. The carbon dioxide compensation points were measured, in air, by an infrared gas analyzer. With RWC decreasing to 73%, leaf compensation points gradually increased to about 300 microliters per liter. After rehydration, compensation points dropped to within range of their initial levels. The compensation point of a non-uniformly dehydrated tissue is affected mainly by its less dehydrated areas. The water potentials and osmotic potentials of both species were plotted vs. RWC on the same graph. The paired osmotic and water potential curves for each species intersected at the point of zero turgor pressure, indicating the development of small negative wall pressures at lower RWC. When leaf potentials were lowered to the same extent in mannitol solutions, the compensation points obtained, for maize and sunflower, were only 15 microliters per liter and 110 microliters per liter. Apparently the drastic increase in compensation point is due neither to stomatal closure nor to decreased water potential per se. A plot of compensation point vs. turgor pressure clearly shows a steep rise in tissue turgor with the same rise in compensation point, suggesting that in cells dehydrated in air, developing negative hydrostatic forces are a decisive factor in affecting net photosynthesis rate. (Casey-Arizona)
W71-07826

AGGREGATE SUPPLY RESPONSES FOR EASTERN COLORADO WHEAT FARMERS,
Economic Research Service, Washington, D.C. Farm Production Economics Div.; and Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 03F.
W71-07827

SOME TECHNIQUES FOR THE MEASUREMENT OF PLANT AND SOIL WATER POTENTIALS WITH THERMOCOUPLE PSYCHROMETERS,
Montana State Univ., Bozeman. Water Resources Research Center.
Thomas J. Nimlos, Lee E. Eddleman, Charles Seeley, and James M. Jones.
Availalbe from the National Technical Information Service as PB-199 037, $3.00 in paper copy, $0.95 in microfiche. Montana Water Resources Research Center, Bozeman, Report No 14, Feb 1971. 25 p, 6 fig, 3 tab, 43 ref. OWRR Project A-039-MONT (1).

Descriptors: *Water measurement, *Soil-water-plant relationships, Plants, *Plant growth.
Identifiers: *Thermocouple psychrometers.

Studies of soil water-plant growth relationships have been hampered by the lack of an accurate, rapid method for the measurement of the tension (potential) water is under in the plant and in the soil. Recently a new method, called the thermocouple psychrometer technique has been developed whereby these measurements can be made. Thermocouple psychrometry is based on the assumption that the relative humidity near a leaf surface or in a soil mass reflects the water potential of that leaf or soil. The techniques involve measuring the relative humidity in or near a plant or soil system with ultrafine thermocouples which, by employing the Peltier effect, can be made to function as psychrometers. The measurement of soil moisture stress with the thermocouple psychrometer is very rapid and relatively easy. (Holje-Montana)
W71-07836

THE GEOCHEMISTRY OF SODA SOILS,
For primary bibliographic entry see Field 02G.
W71-07840

A PROPOSAL OF CLASSIFICATION OF VEGETATION HABITATS ON THE BANKS OF CZECHOSLOVAK WATER COURSES FROM THE HYDROLOGICAL STANDPOINT, (IN GERMAN),
Ceskoslovenska Akademie Ved, Prague. Botanicky Ustav.
For primary bibliographic entry see Field 02E.
W71-07879

TREE GROWTH,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07943

0-18/0-16 RATIOS AND RELATED TEMPERATURES OF RECENT PTEROPOD SHELLS (CAVOLINIA LONGIROSTRIS LESUEUR) FROM THE PERSIAN GULF,
Goettingen Univ. (West Germany). Geological-Paleontogical Inst.
For primary bibliographic entry see Field 02K.
W71-08068

VARIATIONS IN CREOSOTEBUSH (LARREA DIVERICATA) EPIDERMIS,
Agricultural Research Service, Tucson, Ariz. Plant Science Research Div. and Arizona Agricultural Experiment Station, Tucson.
Herbert M. Hull, Samuel J. Shellhorn, and Richard E. Saunier.
Journal of the Arizona Academy of Sciences, Vol 6, No 3, p 196-205, Feb 1971. 8 fig, 2 tab, 37 ref.

Descriptors: *Xerophytes, *Ecotypes, *Plant morphology, *Epidermis, *Cuticle, Resins, Leaves, Stomata, Herbicides, Shrubs, Habitats, Electron microscopy, Absorption.
Identifiers: *Creosotebush, *Chihuahuan Desert, *Guard cells, *Trichomes.

Creosotebush is probably the most common southeastern desert shrub, characterized by leathery, dense leaves with an unusually high weight/area ratio. It is extremely drought resistant and grows in a diversity of habitats. In many areas, it has invaded former grasslands, reducing their forage production and carrying capacity. Chemical control currently appears economically unfeasible because of the excessively high herbicidal rates required. Because epidermal and cuticular structure markedly affect herbicidal absorption, an attempt was made to determine whether these structures differ in plants from 3 widely differing Chihuahuan Desert habitats. Using light and electron microscopy techniques, the structures of cuticles, epidermis cells, guard cells and mesophyll cells were examined. Cuticle and cell wall thicknesses of both leaves and stems varied more among individuals of one location than between locations. Insignificant differences in cuticle thickness between adaxial and abaxial surfaces and in epidermal cell walls indicate that differences in herbicidal sensitivities between collection sites could not be ascribed to differences in epidermal or cuticular development. The thickness of the guard cells and their subsidiary cells indicate they are of little value in transpiration supression. The distinct trichome cuticularization suggests that this structure inhibits solute absorption following a foliar spray. Probable absorption occurs via the stomata or directly through the epidermal cuticle. Since there is an inverse correlation between resin content and elevation, it appears unlikely that resins filter out harmful UV radiation. (Casey-Arizona)
W71-08139

THE ECOLOGY OF SMALL MAMMALS AT SARATOGA SPRING, DEATH VALLEY NATIONAL MONUMENT, CALIFORNIA,
Nevada Univ., Reno.

W. Glen Bradley, and James E. Deacon.
Partially supported by National Park Service Contract 14-10-0434-0989. Journal of the Arizona Academy of Sciences, Vol 6, No 3, p 206-215, Feb 1971. 6 fig, 4 tab, 8 ref.

Descriptors: *Mammals, *Xerophilic animals, *Ecology, *Arid lands, *Water holes, Xerophytes, California, Rodents, Mammal groupings, Wildlife, On-site investigations, Environmental effects, Surveys, Vegetation effects, Physiological ecology, Reproduction, Animal behavior, Biomass, Temperature, Precipitation, Edge effect, Ecosystems, Habitats, Springs.
Identifiers: *Death Valley, *Mojave Desert, *Species compostion.

The Saratoga Springs area of Death Valley National Monument is a low elevation marshy area with a mosaic of diverse habitats. The percentage perennial plant covers of 6 habitats were measured and described. Temperature records during the study range from below freezing in winter to above 40C in the summer. Bats were collected by shooting and mist netting, while rodents were collected in snap traps. The rodent trapping program was designed to compare relative abundance in creosote bush, rocky canyon, sand dune, salt flat and marsh habitats. Stomach and gonadal autopsies were performed to determine food habits and reproductive condition. Short accounts are given of each trapped rodent species, and their numbers relative abundance and biomass in each of the major habitats were tabulated. Excepting the salt flats, the total number of species trapped in the major habitats did not significantly differ, but numbers varied widely. Relative abundances were greatest in the more mesic sand dune and marsh habitats and could be correlated with availability of food (especially green plants), shelter and water. The edge effect created by the spatial relationships between the marsh and sand dunes probably also affects biomass. Young and subadults increase in numbers in the late spring, summer and fall, while winter populations are almost exclusively composed of adults. Stomach analyses indicate a high proportion of green vegetation in diets, and the length of most species' breeding seasons are probably proportional to it's availability. (Casey-Arizona)
W71-08140

EVALUATIONS OF GRASSES, LEGUMES, AND GRASS LEGUME MIXTURES FOR IRRIGATED PASTURES GRAZED BY SHEEP UNDER VARIOUS FERTILITY AND MANAGEMENT PRACTICES,
Agricultural Research Service, Flagstaff, Ariz. Crops Research Div.
For primary bibliographic entry see Field 03F.
W71-08147

PANHANDLE RESEARCH STATION PROGRESS REPORT - 1969, GOODWELL, OKLAHOMA.
Oklahoma State Univ., Goodwell. Agricultural Research.
For primary bibliographic entry see Field 03F.
W71-08149

BREAKTHROUGH SOUGHT IN GRAIN SORGHUM PRODUCTION,
Nebraska Univ., Lincoln. Dept. of Sorghum Physiology; and Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 03F.
W71-08151

2J. Erosion and Sedimentation

POTENTIAL ENERGY AND STREAM MORPHOLOGY,
Illinois State Water Survey, Urbana; and Illinois Univ., Urbana. Water Resources Center.
Chih Ted Yang.
Water Resources Research, Vol 7, No 2, p 311-322, Apr 1971. 12 p, 6 fig, 1 tab, 15 ref. OWRR Project B-023-ILL (2).

Descriptors: *Drainage patterns (Geologic), *Profiles, *Geomorphology, *Mathematical models, *Free energy, Entropy, Geologic control, Stochastic processes, Head loss, Energy dissipation, Energy gradient, Hydraulic gradient.
Identifiers: *Stream order, Potential energy.

Use of the analogy of entropy in thermodynamics reveals two basic laws which govern the formation of all stream systems. The first law is the law of average stream fall, which states that under the dynamic equilibrium condition the ratio of average fall between any two different order streams in the same river basin is unity. The second law is the law of least rate of energy expenditure, which states that during the evolution toward its equilibrium condition a natural stream chooses its course of flow in such a manner that the rate of potential energy expenditure per unit mass of water along this course is a minimum. This minimum value depends on the external constraints applied to the stream. The concavity of a river basin is shown to be the determinative factor in the formation of a stream system. On the basis of Horton's law and the law of average stream fall, longitudinal stream profiles can be calculated. The agreement between observed data and the theories found in this study is excellent. (Knapp-USGS)
W71-07705

NAVIGATION AND SEDIMENTATION CONDITIONS AT TYPICAL LOCK AND DAM, ARKANSAS RIVER, ARKANSAS AND OKLAHOMA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07804

COMPUTER DETERMINATION OF THE GEOMETRY AND TOPOLOGY OF STREAM NETWORKS,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences; and Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07A.
W71-07911

EROSION AND SEDIMENTATION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07939

THE COLLAPSE OF SOLIFLUCTION LOBES AS A FACTOR IN VEGETATION BLOCKFIELDS,
Portland State Univ., Oregon. Dept. of Geography.
For primary bibliographic entry see Field 02C.
W71-07954

HYDROGRAPHY AND HOLOCENE SEDIMENTATION OF THE MERRIMACK RIVER ESTUARY, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W71-07967

SEDIMENT TRANSPORT IN FLOW DISTURBED BY RAINFALL,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
Jerry L. Machemehl.
Partly supported by FWQA. Water Resources Bulletin, Vol 7, No 2, p 317-329, Apr 1971. 13 p, 6 fig, 5 tab, 7 ref.

Descriptors: *Sediment transport, *Open channel flow, *Overland flow, *Rainfall, *Impact (Rainfall), *Turbulence, Turbulent flow, Hydraulic models, Sediment control, Sedimentation, Eros
Precipitation (Atmospheric), Bed load, Suspen
load.
Identifiers: Rainfall-sedimentation relations.

Studies were conducted in a closed system reci
lating research flume to evaluate the relative
fects of high intensity rainfall on von Karm
universal constant and the sediment trans
capacity of shallow flow. The tests in this s
were conducted at flow depths of 0.3 ft and
with discharges less than 0.5 cfs. Point sedi
samples were siphoned from the flow with a s
less steel-pipette sediment sampler. Sediment
centrations were found with a filtering techni
Sediment samples were taken with and wit
rainfall to evaluate the relative effect of the rai
on the transport capacity of shallow
Suspended sediment reduces the value of the
Karman's universal constant. The reduction
with suspended sediment indicates that mixi
less effective and that the sediment tends to
press or dampen out turbulence. Rainfall
suspended sediment reduces the value of von
man's universal constant of turbulent exch
which characterizes the effectiveness of the t
lence in transferring momentum. Reduction
means that the mixing is less effective and the s
lated rainfall and suspended sediment tend to
press the turbulence. The suspended load tran
capacity of the flow appears to be reduced u
simulated rainfall conditions due to a reducti
von Karman's universal constant. (Knapp-USG
W71-08060

**DISTRIBUTION, COMPOSITION AND TR
PORT OF SUSPENDED SEDIMENT IN RE
DO SUBMARINE CANYON AND VICI
(CALIFORNIA),**
University of Southern California, Los An
Dept. of Geological Sciences.
R. M. Beer, and D. S. Gorsline.
Marine Geology, Vol 10, No 3, p 153-175,
1971. 23 p, 10 fig, 27 ref. ONR Grant GB
NSF Contract Nonr 228 (17), NR 083-144.

Descriptors: *Suspended load, *Sediment
port, *Turbidity currents, Density cur
California, Sedimentation, Erosion, Suspen
Turbidity, Continental slope, Density.
Identifiers: Redondo Submarine Canyon (Cali

Redondo Canyon, in the southern half of
Monica Bay, California, is an active subm
canyon through which sands and silts are
ported by periodic submarine slides and
flows. Stream, surface waves, rip currents, a
ternal waves are capable of placing sedimen
suspension over the continental shelf. Subm
slumping is also a primary mechanism fo
suspension of material within submarine can
This material is transported over the shelf by
ty suspension at the thermocline, suspension
ternal waves, and near-bottom currents. Th
surface distribution of suspended sediment i
trolled by the canyon's topographic effects o
rent flow. Near the bottom, suspended loa
very large. It is within this zone that some of t
gest suspended loads occur, apparently due
suspension of material by bottom turbu
created by near-bottom currents, as well
presence of material suspended from the nea
area in the process of seaward transport. (K
USGS)
W71-08064

**NEWPORT SUBMARINE CANYON, CAL
NIA: AN EXAMPLE OF THE EFFECT
SHIFTING LOCI OF SAND SUPPLY
CANYON POSITION,**
University of Southern California, Los An
Dept. of Geological Sciences.
D. W. Felix, and D. S. Gorsline.
Marine Geology, Vol 10, No 3, p 177-198
1971. 22 p, 10 fig, 1 tab, 34 ref. ONR Co
Nonr (228)-17 NR 083-144; NSF Grant GB-

riptors: *Suspended load, *Sediment trans-
*Turbidity currents, Density currents,
ornia, Sedimentation, Erosion, Suspension,
idity, Continental slope, Density.
tifiers: *Newport Submarine Canyon (Calif).

port Submarine Canyon, located off Newport
h, California, is typical of the small shelf
ons of the California continental borderland.
canyon has formed at a point where the shelf is
w and sand moved by waves in longshore drift
ncentrated at a convergence zone. The present
graphic expression of the submarine canyon
sents its most recent position, but one that is
in process of abandonment as a result of shifts
ci of sand input. The Santa Ana River is the
ipal local sand source. Changes in the location
e river mouth during the past century have
d the point of longshore drift convergence
and concentration approximately one kilome-
orthwest of the present canyon head. The
on head is now receiving only fine organic-rich
ents that are building an apparently stable
sit that will ultimately fill the head. Thus, the
e illustrates the process of canyon origin,
opment and ultimate abandonment. (Knapp-
S)
-08065

O WAVES IN THE NORTH SEA OFF THE ST OF HOLLAND,
ersity of East Anglia, Norwich (England).
ol of Environmental Sciences.
McCave.
ne Geology, Vol 10, No 3, p 199-225, Mar
27 p, 18 fig, 49 ref.

riptors: *Sand waves, *Sediment transport,
load, *Bottom sediments, Waves (Water),
nded load, Sands, Ripple marks, Sedimenta-
Shoals, Coasts, Sand bars, Shallow water.
ifiers: *North Sea, *Holland.

quarterly surveys were made of the sand-wave
of the North Sea in 1968-1969. Crest heights
a maximum of 7 m, decreasing to 2 m in the
and towards the coast. Wavelengths are from
o 500 m. Symmetrical and asymmetrical sand
s, and sand waves with superimposed megarip-
re recognized. The northern boundary to the
wave field is caused by decreasing asymmetry
tidal ellipse. This does not occur in a narrow
e extending along the coast of Texel where an
sion of the sand-wave field is found. The
wards decrease in height is mainly caused by
ase in suspension transport of sand. Megarip-
on sand waves are taken to be large scale
g of ripples on dunes seen in flumes. The
ripples represent perturbation of bed-load
port rate and the sand waves perturbation of
nded load transport rate. Thus the northwards
ce of megaripples on sand waves, decrease in
size, decrease in height and increase in
nsion transport, fit in a coherent dynamical
nation of the characteristics of the sand-wave
(Knapp-USGS)
08066

NSPORT OF BEDLOAD AS RIPPLES DUR-AN EBB CURRENT,
ington Univ., Seattle. Dept. of Oceanography.
B. Kachel, and Richard W. Sternberg.
e Geology, Vol 10, No 4, p 229-244, Apr
16 p, 8 fig, 2 tab, 20 ref, append. USAEC
act No AT (45-1)-2220; NSF Grant
149.

iptors: *Sediment transport, *Tides, *Bed
*Ripple marks, Sands, Model studies,
ulic models, Sand waves, Turbulence,
ity, Washington.
fiers: *Puget Sound (Wash).

ge instrumented tripod was used during a
of relatively strong ebb current in Puget
, to measure simultaneously the currents
1.5 m of the sea bed and the changing ripple configuration of a sandy bottom. Measurement of the heights and migration rates of the ripples on time-lapse stereo photographs made it possible to calculate the amount of sediment moved. From the measured velocity profiles, the shear velocity and the fluid power expended on the bed were determined. These measurements of mass transport are compared with the values predicted by several existing bedload transport theories. Einstein's and Yalin's equations predict values with the appropriate trend of the curve of mass transport vs. shear velocity, but their values are too large, because of a difference in the boundary shear stress measurement used in the comparison. Bagnold relates immersed weight of transported sediment to fluid power by a proportionality coefficient, K, which reaches a constant maximum value for any system. Present measurements indicate that K increased exponentially with the growth of ripples, which in turn were related to the flow conditions. When compared with flume data, the mass transport of sediment was adequately predicted. It appears that K does not reach a constant value in most marine environments but is related to the sediment characteristics, the shear stress, and the turbulence of the flow. (Knapp-USGS)
W71-08067

EROSION OF UTTAR PRADESH SOILS BY WATER AND ITS RELATION TO SOIL PROPERTIES,
Allahabad Univ. (India). Dept. of Chemistry.
Anupam Varma, and S. K. De.
Journal of Soil and Water Conservation in India, Vol 18, Nos 1 and 2, p 76-82, Jan-June 1970. 7 p, 2 tab, 17 ref.

Descriptors: *Soil erosin, *Soil physical properties, *Soil chemical properties, Topography, Slopes, Laboratory tests, Soil texture, Soil chemistry, Leaching, Soil conservation.
Identifiers: *India, Uttar Pradesh (India).

Observations made in the laboratory on erosion of some Uttar Pradesh soils were correlated with soil properties. The extent of erosion by water depends not only on the time of contact of the soil by water but also on the slope percentage and physico-chemical properties of soils. Further, soils from different climatic regions behave differently so far as the extent of erosin is concerned, although they may be of the same texture. With the doubling of slope percentage, the extent of erosion doubled or more than doubled. The erosion rate appeared to be correlated with the time and the amount of soil left after erosion. The rate of erosion is directly proportional to the ionic concentration of the soil. (Knapp-USGS)
W71-08074

CHEMICAL CHARACTERISTICS OF FRACTIONATED HUMIC ACIDS ASSOCIATED WITH MARINE SEDIMENTS,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 02K.
W71-08090

AN INFRA-RED STUDY OF CLAY MINERALS. 1. THE IDENTIFICATION OF MONTMORILLONITE-TYPE CLAYS IN MARINE SEDIMENTS,
Liverpool Univ. (England). Dept. of Oceanography.
R. Chester, and H. Elderfield.
Chemical Geology, Vol 7, No 2, p 97-105, Mar 1971. 9 p, 1 fig, 3 tab, 16 ref.

Descriptors: *Clay minerals, *Analytical techniques, *Infrared radiation, Expansive clays, Water chemistry, Ion exchange, Mineralogy, Spectrometers, Spectroscopy, Sediments, Bottom sediments, Clays.
Identifiers: Infrared spectroscopy.

The infrared spectra which result from reacting fifteen organic materials (including monohydric and polyhydric alcohols, hydrocarbons amines and azo dyes) with samples of the clay minerals illite, chlorite, kaolinite and montmorillonite were determined. A complex is formed between 2,2-dipyridyl and montmorillonite. The complex is specific to montmorillonite, and replaces water molecules in inter-sheet positions in the clay structure. This complex is made the basis of an infrared technique which may be used to identify expanding lattice clays in multi-clay samples. The technique may be applied to marine sediments, and is described in detail. (Knapp-USGS)
W71-08091

POSSIBILITY OF PREDICTING WATER TURBIDITY AS ILLUSTRATED BY THE OKA RIVER BASIN (RUSSIAN: O VOZMOZHNOSTI PREDSKAZANIYA MUTNOSTI VODY NA PRIMERE REK BASSEYNA OKI),
I. V. Starostina.
Meteorologiya i Gidrologiya, No 12, p 73-79, Dec 1970. 7 p, 3 fig, 4 ref.

Descriptors: *Runoff forecasting, *Turbidity, *Sediment transport, *Sediment discharge, *Suspended load, Snowmelt, Seasonal, Snow cover, Watersheds (Basins), Channel erosion, Air temperature, Precipitation (Atmospheric), Erosion, Foreign research.
Identifiers: *USSR, Oka River, Kaluga Oblast, Ice crust, Slope erosion.

Because of its typical river sediment formation and regime the Oka River basin near Kaluga was studied with respect to methodology applications for predicting water turbidity. Data from observations of suspended sediments for five discharge sites on rivers of the forest and forest-steppe zone were used. The average long-term turbidity value varied between 100 and 1,500 g/cu m; variability was measured by variation coefficients of 0.35-0.70. Maximum turbidity, formed by melt waters, preceded maximum water discharge at sites of the forest zone by 3-10 days and at sites in the forest-steppe zone by 1-3 days. Predictions of daily turbidity of the Oka River at Kaluga can be made for a period of 5-12 days, beginning from the first day when snowmelt is vigorous and from the 7th to 8th day when snowmelt is slow, provided turbidity is above 100 g/cu m. Best results in predicting turbidity are obtained for spring periods with a vigorous snow thaw covering the entire basin. Turbidity of two- and three-peak high waters is more difficult to predict. Turbidity in years during which a basin is more than 80% covered by ice or has no ice crust at all is impossible to predict. (Josefson-USGS)
W71-08101

RELATIONSHIP BETWEEN THE RATE OF SHORE DEFORMATION AND FLOW VELOCITY (RUSSIAN: ZAVISIMOST' INTENSIVNOSTI BEREGOVYKH DEFORMATSIY OT SKOROSTI POTOKA),
Moscow State Univ., (USSR).
For primary bibliographic entry see Field 08B.
W71-08102

MORPHOLOGICAL SLOPE EVOLUTION BY LINEAR AND SURFACE DEGRADATION,
Wroclaw Univ. (Poland). Inst. of Geography.
Alfred Jahn.
Geographia Polonica, No 14, p 9-21, 1968. 13 p, 7 fig, 20 ref.

Descriptors: *Degradation (Stream), *Geomorphology, *Slopes, *Erosion, *Rocks, Glaciation, Weathering, Gully erosion, Quaternary period, Geologic time, Tertiary period, Petrography, Orography.
Identifiers: *Poland, Carpathian Mountains, Sudeten Mountains, Slope profile, Linear erosion, Surface degradation.

The slope is treated as a surface which undergoes degradation due to denuding agents and the erosive

incision of water channels. Erosive decrements in rock mass may be calculated by comparing the slope surface as it is today with visible forms deviating in plus values (Klippen under conditions of surface degradation) or in minus values (dissection where linear degradation has taken place). Examples cited from the Sudeten and the Carpathians where slopes were treated in their totality show that the removal of rock mass is caused primarily by the erosive action of water. It is believed that the action of water running down a slope in small rills may gradually induce (especially in soft rock types) a complete modification of the slope, including its recession. Surface degradation effects all types of rocks without much variety in its way of acting. Often the susceptibility of rock to erosive dissection determines the ultimate evolution of a slope. The morphological difference between a slope of soft rocks and massive rocks resolves itself into a difference in resistance of the rock material to linear erosion, with weathering as an intermediate process. This explains the difference in slope forms between the Carpathians and the Sudeten, or the striking contrast apparent in the slopes of Sleza and Radunia, the two mountains close to each other in the Sudeten forefield. Erosive dissection of rock material is an important process in slope degradation and recession, probably more important than surface degradation. (Josefson-USGS)
W71-08106

NEO-PLEISTOCENE CHANGES IN A LARGE RIVER VALLEY USING THE ORDER AS AN EXAMPLE,
Wroclaw Univ. (Poland). Inst. of Geography.
For primary bibliographic entry see Field 02C.
W71-08107

THE DYNAMICS OF SEDIMENTARY ENVIRONMENTS IN THE LIGHT OF HISTOGRAM TYPES OF GRAIN ABRASION,
Adam Mickiewicz Univ., Poznan (Poland). Inst. of Geography.
Ludwika Krygowska, and Bogumil Krygowski.
Geographia Polonica, No 14, p 87-92, 1968. 6 p, 3 fig, 1 tab, 12 ref.

Descriptors: *Deposition (Sediments), *Abrasion, *Sediments, *Histograms, Sieve analysis, Particle size, Beaches, Dunes, Sands, Weathering, Granites, Till, Rivers, Gravels.
Identifiers: *Poland, Grain abrasion, Sand grains.

Numerous attempts have been made to determine the dynamics of sedimentary environments from studies of the deposits left by them. These attempts have mostly been based on the structure of the deposit, its particle-size composition and, less often, its grain abrasion. By applying mechanical graniformametry, a relatively rapid determination of grain abrasion from a large number of samples is possible. Conclusions derived in the present work are based on an examination of more than 1,500 samples collected from 8 different sedimentary environments and on several thousand analyses (abrasion tests) by means of their graniformameter. The source material confirms the view that a sedimentary environment of deposition and its dynamics are characterized by more than one parameter. The parameters considered here are the coefficient of grain abrasion, the coefficient of abrasion irregularity and the histogram type of grain abrasion. (Josefson-USGS)
W71-08108

THE EASTERN SIBERIAN KARST,
Wroclaw Univ. (Poland). Inst. of Geography.
Marian Pulina.
Geographia Polonica, No 14, p 109-117, 1968. 9 p, 6 fig, 1 tab, 19 ref.

Descriptors: *Karst, *Chemical degradation, *Erosion, *Topography, Orography, Watersheds (Basins), Caves, Meteorological data, Hydrogeology, Salts.
Identifiers: *Eastern Siberia, Siberian Platform, Irkutsk Amphitheater, Karst rocks, Karst hydrography, Karst regionalization, Karst relief.

To study chemical karst denudation, karst phenomena in the Siberian platform and in the mountain regions of the Eastern Sayan Ridge and Chamar-Daban on the Baykal shore, constituting part of the 'Irkutsk Amphitheater,' are examined. The areas covered by soluble rocks occupy some 30% of the surface of the Irkutsk Amphitheater, equivalent to a total of more than 300,000 sq km. The overall chemical denudation for karsted and nonkarsted areas comprising the Angara and the Baykal drainage basins totals more than 3 cu m/sq km/yr. With regard to mineral material carried by the Angara, chemical degradation accounts for 10-20%. Results obtained show that the best developed karst relief of the Siberian Platform lies in the Irkutsk Amphitheater. In the mountain areas of the Irkutsk Amphitheater the evolution of karst relief is insignificant, with older karst forms surviving merely in relict form. The effect of present day chemical denudation in Eastern Siberia fluctuates between 2 and 60 cu m/sq km/yr, representing, at most, one half of the values for European karst regions in a temperate climate at similar geographical latitudes. The new large storage basin for the Bratsk hydroelectric plant in the Angara valley, by raising the water level 60 m within the karst regions, has revived old forms of surface karst and caverns. The chemical infiltration of active transitory waters of the Angara is leading to the transformation of older and the creation of new karst mesoforms. (Josefson-USGS)
W71-08109

ERODIBILITY OF SLOPES (PHASE I),
California State Div. of Highways. Materials and Research Dept.
Travis Smith.
Available from the National Technical Information Service as PB-196 526, $3.00 in paper copy, $0.95 in microfiche. Interim Report No M and R 632101, July 1970.

Descriptors: *Highways, *Erosion control, *Soil tests, Slopes, Test procedures, California, Sampling.

The results of a literature search and the results of a preliminary laboratory testing program . are presented. Based upon past research by the U.S. Department of Agriculture and other agencies, it now appears that erosion potential of a given soil can be evaluated by appropriate laboratory tests, the two most promising being the 'Dispersion ratio' and the 'surface aggregation ratio'. Preliminary test results utilizing both tests were reasonably consistent. The use of larger samples and a lesser degree of sample disturbance are expected to improve reproducibility.
W71-08171

2K. Chemical Processes

DEVELOPMENT OF INSTRUMENTAL TECHNIQUES FOR THE ANALYSIS OF TRACE ORGANIC CONSTITUENTS IN WATER,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 05A.
W71-07839

ADSORPTION OF ORGANIC COMPOUNDS ONTO SOLIDS FROM AQUEOUS SOLUTIONS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Chemistry.
For primary bibliographic entry see Field 05D.
W71-07910

STEAM FILM SAMPLING OF WATER I MASS SPECTROMETRIC ANALYSIS OF T DEUTERIUM CONTENT,
Atomic Energy of Canada Ltd., Chalk River (tario). Chalk River Nuclear Labs.; and Ato Energy of Canada Ltd., Chalk River (Onta General Chemistry Branch.
W. M. Thurston.
The Review of Scientific Instruments, Vol 42 5, p 700-703, May 1971. 4 p, 5 fig, 2 tab, 3 ref.

Descriptors: *Sampling, *Water chemi *Steam, *Deuterium, *Analytical technic Spectrometers, Hydrogen, Radioisotopes, W vapor, Water temperature, Heat transfer, procedures, Salinity, Dissolved solids, St isotopes.
Identifiers: *Mass spectrometry.

The Leidenfrost effect, characterized by film ing of a liquid adjacent to a hot metal surface adapted in two forms for sampling water vapo mass spectrometer analysis to determine the terium-to-hydrogen (D/H) ratio. Both a hot p and a hot plate configuration convert liquid w to vapor without interference from dirt or disso material in the liquid phase. Automatic semiautomatic analysis of the D/H ratio in w was achieved with a precision of 0.1 ppm at na deuterium concentrations. A 2 min cycle time used for multiple sampling of bulk water and f ing stream samples. (Woodard-USGS)
W71-07918

GEOCHEMISTRY OF WATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07938

COLUMBIA RIVER EFFECTS IN NORTHEAST PACIFIC, REPORT PROGRESS, JUNE 1969 THROUGH JUNE 1
Washington Univ., Seattle. Dept. of Oceanogra
For primary bibliographic entry see Field 05C.
W71-07969

HYDROGRAPHIC OBSERVATIONS IN EASTERN IRISH SEA WITH PARTICU REFERENCE TO THE DISTRIBUTION NUTRIENT SALTS,
Ministry of Agriculture, Fisheries and F Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 05B.
W71-08063

0-18/0-16 RATIOS AND RELATED TEMPE TURES OF RECENT PTEROPOD SHE (CAVOLINIA LONGIROSTRIS LESUE FROM THE PERSIAN GULF,
Goettingen Univ. (West Germany). Geolog Paleontogical Inst.
J. Hoefs, and M. Sarnthein.
Marine Geology, Vol 10, No 4, p M 11-M 16, 1971. 6 p 1 fig, 1 plate, 1 tab, 11 ref.

Descriptors: *Stable isotopes, *Sediment rates, *Oxygen, *Sedimentation, *Water temp ture, Water analysis, Plankton, Calcium carbon
Identifiers: *Oxygen isotopes, Pteropods.

The temperatures obtained by mass spectrom measurements of the 0-18/0-16 ratio of Re pteropod shells from the Persian Gulf corr relatively with the actual temperature and sa conditions found in the Gulf. This argues for a tochthonous plankton shell production in whole investigation area. Still problematic are questions of when and where in the water col the carbonate is incorporated into the skel and of how to exclude inhomogeneities in plan sediment samples from areas with very low mentation rates and active bioturbation. (Kn USGS)
W71-08068

ON IN THE MULLICA RIVER AND IN REAT BAY, NEW JERSEY,
inceton Univ., N.J. Dept. of Geological and ophysical Sciences.
r primary bibliographic entry see Field 02L.
71-08089

IEMICAL CHARACTERISTICS OF FRAC-ONATED HUMIC ACIDS ASSOCIATED TH MARINE SEDIMENTS,
dford Inst., Dartmouth (Nova Scotia).
A. Rashid, and L. H. King.
emical Geology, Vol 7, No 1, p 37-43, Jan 1971. , 2 tab, 17 ref.

scriptors: *Humic acids, *Chemical analysis, hromatography, *Bottom sediments, *Sea ter, Organic matter, Organic acids, Water analy-

ntifiers: Marine sediments.

mic acids were fractionated on the basis of lecular weight ranges by using a column chro-tographic technique with different grades of hadex gels. Further studies on these fractions gest that the major oxygen-containing func-al groups are concentrated on the low molecu-weight fractions. The C/H ratios increase with increasing molecular weight. (Knapp-USGS)
1-08090

INFRA-RED STUDY OF CLAY MINERALS. THE IDENTIFICATION OF MONTMORIL-NITE-TYPE CLAYS IN MARINE SEDI-NTS,
erpool Univ. (England). Dept. of Oceanog-hy.
primary bibliographic entry see Field 02J.
1-08091

CTERIAL PROCESSES IN THE OXIDATION D LEACHING OF SULFIDE-SULFUR ORES VOLCANIC ORIGIN,
demiya Nauk SSSR, Moscow. Institut robiologii.
V. Ivanov.
mical Geology, Vol 7, No 3, p 185-211, Apr 1. 27 p, 15 fig, 10 tab, 21 ref.

criptors: *Oxidation, *Leaching, *Sulfur, *Vol-oes, *Sulfur bacteria, Sulfates, Sulfides, Mining, veys, Geochemistry, Weathering.
tifiers: *USSR.

ious gaseous sulfur compounds constitute a of volcanic gases in all stages of their evolu-, beginning with eruption of melted lava and in-ing post-volcanic solfatara activity. Under sur- and near-surface conditions, native sulfur rates from volcanic sulfurous gases. More or substantial sulfur deposits are widely dis-ted in regions of active volcanism. In Central South America, Indonesia, Japan, and some r countries, sulfur of volcanic origin is ob-ed in commercial quantities. In the U.S.S.R., r deposits and sulfur-shows of volcanic origin found in many places of the Kamchatka penin- and the Kuril Islands. Processes of sulfur ox-on to sulfuric acid with the participation of obacillus thiooxidans occurs in the near-surface s of sulfide-sulfur ores of the impregnation-asomatic sulfur deposits in the Kuril-Kamchat-egion. Sulfide minerals decompose in a sul-acid medium formed in the oxidation zone; ltaneously, iron is carried out by acid waters redeposited from solutions along the periphe-of the oxidation zones. In the oxidation ess, new formation of secondary sulfate rals takes place, while migration of silica and redeposition is observed in several deposits. ite, silicon minerals and rutile are the stable rals in the sulfuric-acid weathering zone. refore, formation of porous quartz-opal rocks is nd result of oxidation and leaching of sulfide-r ores. (Knapp-USGS)
-08092

LIMESTONE SOLUTION WITHIN THE EAST MENDIP AREA, SOMERSET,
Saskatchewan Univ., Regina. Dept. of Geography.
For primary bibliographic entry see Field 02F.
W71-08116

PRELIMINARY RESULTS OF AN APPLICATION OF THE PROCEDURE FOR THE MEASUREMENT OF AGGRESSIVENESS OF WATER TO CALCIUM CARBONATE,
For primary bibliographic entry see Field 02F.
W71-08118

THE SOURCE IDENTIFICATION OF MARINE HYDROCARBONS BY GAS CHROMATOGRAPHY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W71-08155

2L. Estuaries

REDEFINITION OF SALINITY,
Scientific Committee on Oceanic Research; and International Council for the Exploration of the Sea, Hydrography Committee; and International Association of the Physical Sciences of the Ocean.
Warren S. Wooster, Arthur J. Lee, and Gunter Dietrich.
Journal of Marine Research, Vol 27, No 3, p 358-360, 1969. 6 ref.

Descriptors: *Salinity, *Measurement, *Water analysis, Sea water, Analysis, Electrical conductance, Conducitivity, Analytical techniques, Oceanography.
Identifiers: UNESCO, International Oceanographic Tables, Salinity redefinition.

According to the old definition, salinity was expressed in g of dissolved solid material per kg of sea water following substitution of bromine by an equivalent quantity of chlorine, conversion of carbonates to oxides, and destruction of organic matter. This complicated procedure was usually replaced by a questionable empirical formula: S 0.1% — 0.030 .. 1.8050 Cl 0.1%. With the introduction of electrical conductivity analyses, the salinity was defined as 1.80655 Cl 0.1% and the chlorinity was converted to salinity on the basis of the polynomial computed by using least squares. This formula permitted construction of the International Oceanographic Tables, including conductivity ratios from 0.85000 to 1.17999 and the range of salinity from 29,196 to 42,168 0.1%. Oceanographers are encouraged to use the new definition of salinity. (Wilde-Wisconsin)
W71-07874

STUDIES OF PRIMARY PRODUCTIVITY IN COASTAL WATERS OF SOUTHERN LONG ISLAND, NEW YORK,
Dow Chemical Co., Freeport, Tex; and Puerto Rico Univ., Mayguez. Dept. of Marine Sciences; and Town of Hempstead, N.Y. Dept. of Conservation and Waterways; and Virgin Islands Coll., St. Thomas.
E. F. Mandelli, P. R. Burkholder, T. E. Doheny, and R. Brody.
Marine Biology, Vol 7, No 2, p 153-160, 1970. 9 fig, 2 tab, 34 ref.

Descriptors: *Primary productivity, *Coasts, *Phytoplankton, *Estuaries, *Standing crop, Seasonal, Diatoms, Dinoflagellates, Chlorophyll, Photosynthesis, Temperature, Sampling, Salinity, Dissolved oxygen, Nutrients, Carbon radioisotopes, Phosphates, Silicates, Solar radiation, Depth, Thermocline, Nitrates, Light intensity, Eutrophication, Marine algae, Sea water, New York.
Identifiers: *Coastal waters, *Southern Long Island, Skeletonema costatum, Thalassiosira, Chaetoceros, Rhizosolenia alata, Peridinium depressum, Peridinium pallidum, Ceratium massilense, Ceratium furca, Ceratium tripos, Ceratium macroceros, Noctiluca miliaris, Gymnodinium splendens, Exuviella marina, Eutreptia, Nitzschia seriata, Thalassionema nitzschoides, Asterionella japonica, Chlorophyll-a.

In conservation of coastal marine resources, maintenance of natural primary productivity of coastal waters is significant. During 1966, monthly determinations of phytoplankton productivity of tidal esturaries and coastal waters of southern Long Island were made. Sustained blooms of green flagellates and dinoflagellates were found during spring and summer in estuarine waters; in coastal areas alternating abundances of diatoms and dinoflagellates dominated the standing crop during late winter, early fall, and summer. The chlorophyll-a distribution in estuaries exhibited two patterns, lasting about six months each, with concentration ranging from 1.0 to 27.6 mg/cu m. In the coastal areas its distribution showed a reversed pattern with range from 1.45 to 10.15 mg/cu m. Vertical distribution of chlorophyll-a within the coastal region euphotic zone showed similar patterns both nearshore and offshore. Mean photosynthesis rates per unit of chlorophyll-a varied from 3.1 to 3.5 mg carbon/mg chlorophyll-a/hour; at light saturation, ratio varied with water temperature and species composition. Mean primary productivity values were 0.35, 0.22, 0.16 g carbon/cu m per day for estuaries, nearshore, and offshore areas, respectively, decreasing seaward. (Jones-Wisconsin)
W71-07875

HIGH MOLECULAR WEIGHT ALGAL SUBSTANCES IN THE SEA,
Naval Undersea Research and Development Center, Pasadena, Calif.
J. W. Hoyt.
Marine Biology, Vol 7, No 2, p 93-99, 1970. 3 fig, 3 tab, 19 ref.

Descriptors: *Molecular structures, *Algae, *Fluid friction, *Littoral, Plant growth substances, Phytoplankton, Fluid mechanics, Exudation, Oceans, Chlorophyta, Phaeophyta, Rhodophyta, Marine bacteria.
Identifiers: *High molecular weight compounds, *Molecular size, *Algal exudates, Extracellular material, Turbulent friction, Seaweed, Porphyridium cruentum, Porphyra, Gigartina.

Turbulent-flow measurements in a special rheometer revealed that commercial seaweed extracts and certain members of phytoplankton have extracellular materials of large molecules with weights exceeding 50,000. Extracts from a variety of littoral algae, particularly of Porphyra and Gigartina genera, have changed the turbulent friction thereby indicating the presence of high-polymer substances. Porphyridium cruentum produced friction reduction as high as 60%. Results suggest that algal exudates are the source of high molecular compounds in the sea. (Wilde-Wisconsin)
W71-07878

THERMOSTABILITY OF LITTORINA MOLLUSKS AS RELATED TO ENVIRONMENTAL CONDITIONS OF DIFFERENT SPECIES (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Biologii.
For primary bibliographic entry see Field 05C.
W71-07888

RELATION OF THE PHYTOPLANKTON TO TURBULENCE AND NUTRIENT RENEWAL IN CASCO BAY, MAINE,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W71-07889

HYDROGRAPHY AND HOLOCENE SEDIMENTATION OF THE MERRIMACK RIVER ESTUARY, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Geology.

Allan D. Hartwell.
California University Department of Geology Contribution No 5-CRG, 1970. 166 p, 62 fig, 32 ref. ONR Contract Nonr N00014-67-A-0230-0001 Task Order NR388-084.

Descriptors: *Hydrography, *Sedimentation, *Estuaries, *Massachusetts, Tidal effects, Streamflow, Runoff, Sediment distribution, Particle size, Water circulation, Sediment transport, Currents (Water), Salinity, Alluvial channels, Deltas, Flooding.
Identifiers: *Merrimack River estuary (Mass).

The Merrimack River estuary is situated on glaciated terrain along the coast of northeastern Massachusetts. When the tide floods during periods of normal and high runoffs, a sharp, slightly tilted boundary develops between the intruding salt-water mass and the overriding fresh water. The salt water from the ocean is deflected to north. The fresh water ponds up on the south side, where a significant amount of the suspended sediment and pollutant load carried by the river is deposited. When discharge drops below approximately 3000 cfs, the stratification disappears and the estuary becomes partially mixed. Maximum ebb-current velocities, which are frequently twice as strong as flood-current velocities, are concentrated in the surface portion, whereas maximum flood-current velocities occur near the river bottom. The distribution of bottom sediments is closely related to the hydraulic circulation pattern, tidal current velocities, bottom topography, and sediment source areas. (Woodard-USGS)
W71-07967

POPULATION DYNAMICS AND SALINITY TOLERANCE OF HYADESIA FUSCA (LOHMAN) (ACARINA, SARCOPTIFORMES) FROM BRACKISH WATER ROCKPOOLS, WITH NOTES ON THE MICROENVIRONMENT INSIDE ENTEROMORPHA TUBES,
Stockholm Univ. (Sweden). Asko Lab.; and Stockholm Univ. (Sweden). Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W71-08026

ENVIRONMENTAL FACTORS CONTROLLING THE EPIPSAMMIC FLORA ON BEACH AND SUBLITTORAL SANDS,
Marine Lab., Aberdeen (Scotland); and Puerto Rico Univ., Rio Piedras. Inst. of Marine Biology.
J. H. Steele, A. L. S. Munro, and G. S. Giese.
Journal of the Marine Biological Association of the United Kingdom, Vol 50, p 907-918, 1970. 8 fig, 2 tab, 14 ref.

Descriptors: *Marine plants, *Beaches, *Sands, *Ocean waves, *Environmental effects, Drainage, Oxygen, Organic matter, Microorganisms, Pumping, Chlorophyll, Diatoms, Depth, Algae, Sulfides, Tidal effects, Bacteria, Marine microorganisms, Energy, Littoral.
Identifiers: *Epipsammic flora, *Sublittoral, Scotland, Beach level, Firemore (Scotland), Rhodamine B, Interstitial water movement, Sand mixing.

Beach level alterations, sand mixing by wave action, water percolation due to pressure changes associated with waves, and water drainage into beaches were studied on an exposed beach in Scotland. Results suggests that drainage is the dominant effect on the littoral zone in supplying oxygen and organic matter to the interstitial microflora. Sublittorally, pumping due to wave action may be important. On exposed beaches, effect of wave action in mixing and redistributing surface layer of sand will determine particle size and inhibit formation of algal surface mats and unattached debris accumulation. These effects are insufficient to explain the different depth distributions of chlorophyll, the oxygen profile differences, and the sulfide accumulations below 5 to 10 cm in sand offshore but not at low water mark. Main energy flow into interstitial ecosystem is by uptake of soluble organic matter by bacteria attached to sand grains. Decreased rate of sand mixing offshore and increased water movement at low water can explain differences in chlorophyll profiles in littoral and sublittoral areas but do not reveal the mechanisms by which diatoms below the sand surface at low water mark can survive for long periods in the dark. (Jones-Wisconsin)
W71-08039

COMPARISON OF TWO STORAGE METHODS FOR THE ANALYSIS OF NITROGEN AND PHOSPHORUS FRACTIONS IN ESTUARINE WATER,
Bureau of Commercial Fisheries, Beaufort, N.C. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05A.
W71-08050

HYDROLOGY OF THE YTHAN ESTUARY WITH REFERENCE TO DISTRIBUTION OF MAJOR NUTRIENTS AND DETRITUS,
Aberdeen Univ., Newburgh (Scotland). Culterty Field Station.
J. H. Leech.
Journal of the Marine Biological Association of the United Kingdom, Vol 51, No 1, p 137-157, Feb 1971. 21 p, 12 fig, 14 tab, 19 ref.

Descriptors: *Estuaries, *Nutrients, *Water chemistry, Water balance, Tides, Mixing, Density stratification, Ecology, Saline water intrusion.
Identifiers: Ythan Estuary (Scotland).

The Ythan estuary, a short shallow estuary in northeastern Scotland, was surveyed over a 2-year period to determine environmental characteristics and distribution of nutrients and organic carbon. The tide is the dominant environmental factor. Ratio of tidal prism volume to fresh water volume at mean high water is about 20:1. Flow ratios indicate that the estuary is well mixed. Flushing time for mean tides was calculated as 1.15 tidal periods. The horizontal salinity gradient varied seasonally and with tidal amplitude. Seasonal variations were related to rainfall and evaporation. Channel salinities near the mouth ranged from 1.7 parts per 1000 at low tide in spring to 34.2 parts per thousand at high tide in summer. The horizontal gradient in nutrient concentration was related to tidal incursion. Freshwater levels of inorganic phosphate were slightly higher than marine concentrations; amounts of nitrate and silicate in the fresh water were about an order of magnitude greater than in marine water. Fresh water supplies about 70% of the nitrate and 80% of the silicate which flows into the estuary; marine water contributes about 70% of the phosphate. Most of the organic matter entering the estuary with fresh water was detritus of terrestrial origin. The marine contribution of particulate carbon exceeded that of fresh water by an order of magnitude. (Knapp-USGS)
W71-08062

DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED SEDIMENT IN REDONDO SUBMARINE CANYON AND VICINITY (CALIFORNIA),
University of Southern California, Los Angeles. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W71-08064

NEWPORT SUBMARINE CANYON, CALIFORNIA: AN EXAMPLE OF THE EFFECTS OF SHIFTING LOCI OF SAND SUPPLY UPON CANYON POSITION,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W71-08065

SAND WAVES IN THE NORTH SEA OFF THE COAST OF HOLLAND,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 02J.
W71-08066

TRANSPORT OF BEDLOAD AS RIPPLES DU ING AN EBB CURRENT,
Washington Univ., Seattle. Dept. of Oceanograph
For primary bibliographic entry see Field 02J.
W71-08067

NUTRIENT DATA ON SEDIMENT SAMPL OF THE POTOMAC ESTUARY, 1966-1968,
Environmental Protection Agency, Annapolis, M Water Quality Office.
For primary bibliographic entry see Field 05A.
W71-08078

IRON IN THE MULLICA RIVER AND GREAT BAY, NEW JERSEY,
Princeton Univ., N.J. Dept. of Geological a Geophysical Sciences.
L. S. Coonley, Jr., E. B. Baker, and H. D. Holland
Chemical Geology, Vol 7, No 1, p 51-63, Jan 197 13 p, 3 fig, 4 tab, 9 ref. NSF Grant GA-985.

Descriptors: *Iron, *Water chemistry, *Bott sediments, Pyrite, Solutes, Oxidation-reducti potential, Hydrogen ion concentration.
Identifiers: *Mullica River (NJ).

The water of Mullica River, New Jersey, contai on the average, several ppm iron. Mixing w ocean water in the lower reaches of the river and Great Bay removes this iron as iron hydroxi flocs. Pyrite is formed in some of the sediments, b a search for other iron minerals in Great Bay w unsuccessful. It is likely that most of t precipitated iron hydroxide is swept out of Gr Bay into the Atlantic Ocean by tidal currents. napp-USGS)
W71-08089

INTERNATIONAL, NATIONAL AND STA ELEMENTS OF OCEANS AND COAST ZONE MANAGEMENT,
California Advisory Commission on Marine a Coastal Resources.
For primary bibliographic entry see Field 06E.
W71-08158

FLORIDA MIDDLE GROUND,
Florida State Univ., Tallahassee. Dept. of Ocean raphy.
H. W. Austin.
Marine Pollution Bulletin, Vol 1 (NS), No 1 171-172, Nov 1970. 1 fig, 1 ref.

Descriptors: *Gulf of Mexico, *Oceanograp *Bioindicators, *Analytical techniques, Biologi properties, Chemical properties, Physical prop ties, Florida, Sea water, Hydrograph analy *Estuaries.
Identifiers: *Florida Middle Ground, Transit zone, West Florida Shelf.

A comprehensive 18-month oceanographic st of the Florida Middle Ground is nearing com tion by scientists of the Florida State Univer System. This Gulf of Mexico region is located the outer edge of the West Florida Shelf betw three water masses, the Gulf Loop Current, west Florida estuarine waters, and the Florida waters. It is a productive fisheries source unique in biological, oceanographic and hyd graphic respects. The research program consist monthly survey cruises to collect biological, che cal and physical data. The useful role of indica organisms in measuring short term changes physical and chemical characteristics is describ Results so far are outlined, with the Middle Gro appearing as a transition zone between the th water masses. (McEntyre-PAI)
W71-08159

ASTS OF FRANCE, GENERAL STUDY OF EMICAL POLLUTION DISCHARGED INTO E SEA. INVENTORY AND STUDY OF TOX-TY, VOLUME III, ATLANTIC (IN FRENCH),
ıtre d'Etudes et de Recherches de Biologie et ɔceanographie Medicale, Nice (France).
primary bibliographic entry see Field 05C.
1-08165

VIRONMENTAL FACTORS AFFECTING Y AND ESTUARINE ECOSYSTEMS OF THE XAS COAST,
ıstal Ecosystems Management, Inc., Fort rth, Tex.
primary bibliographic entry see Field 05C.
1-08181

CUMENTATION REPORT--FWQA DYNAM-ESTUARY MODEL,
ironmental Protection Agency, Washington, . Water Quality Office.
primary bibliographic entry see Field 05G.
1-08189

. WATER SUPPLY AUGMENTATION AND CONSERVATION

.. Saline Water Conversion

NEYCOMB THERMAL TRAP,
v Mexico State Univ., University Park.
primary bibliographic entry see Field 07B.
1-07706

LINE WATER CONVERSION PROGRAM--PROPRIATION.
primary bibliographic entry see Field 06E.
1-07714

NOVATION OF MUNICIPAL WASTE TER BY REVERSE OSMOSIS,
ironmental Protection Agency, Cincinnatti, o. Environmental Research Lab.
primary bibliographic entry see Field 05D.
1-07756

TERMINING THE FEASIBILITY OF OB-NING DRY BRINE EFFLUENTS FROM IN-ND DESALTING PLANTS,
rett Research and Development Co., Inc., 'erne, Calif.
). Ridley, S. Sack, R. N. Jacobson, and E. mtob.
sale by the Superintendent of Documents, US ernment Printing Office, Washington, DC, 02, Price $1.05. Office of Saline Water earch and Development Progress Report No . Oct 1970. 102 p, 27 fig, 15 tab, 14 ref, 3 ap-d. OSW Contract 14-30-2661.

criptors: *Waste disposal, *Evaporators, ign criteria, Operating costs, Capital costs, ines, *Brine disposal, Waste water disposal, alination plants.
ntifiers: *Solar ponds.

ility designs, capital costs, and annual expenses presented for systems of disposal of brine ef-nts produced by desalination plants operating brackish waters at inland locations in the tern United States. The disposal systems re-ed on include: (1) solar ponds, and (2) tistage flash evaporators in conjunction with er conventional crystallizers or solar ponds. brines considered were those that would result n desalination of four typical brackish waters nd in the Western United States. Geographic licability of the solar pond system is discussed the results are displayed on a map of the area sidered. A computer program, used to calculate pond size from brine and climate variables, is also included. (Callahan-Office of Saline Water)
W71-07831

INVESTIGATION OF CELLULOSE ETHER ESTERS FOR REVERSE OSMOSIS MEMBRANES,
Gulf South Research Inst., New Orleans, La.
J. K. Smith, E. Klein, F. Morton, and T. Casebonne.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $0.45. Office of Saline Water Research and Development Progress Report No 630, Dec 1970. 35 p, 8 ref. OSW Contract 14-01-0001-2246.

Descriptors: Reverse Osmosis, *Membranes, *Permselective membranes, *Semipermeable membranes, *Desalination, Saline water, Separation techniques, Membrane processes, Osmosis, *Membrane processes.
Identifiers: Ethyl cellulose, Cellulose ether esters, Cellulosic membranes, Solubility parameters.

The formation of asymmetric membranes from ethyl cellulose has been investigated, and the potential for their use in reverse osmosis evaluated. Previous investigators have shown that this cellulose derivative has water permeability and salt permeability properties which indicate that it should form highly rejecting membranes. In addition, ethyl cellulose polymers have hydrolytic stability and mechanical resistance properties which compare favorably to cellulose acetate polymers. The first phase of this program examined the effects that the degree of substitution has on the physical and mechanical properties. It was demonstrated that the water content of the polymer films increased as the degree of substitution decreased and fewer hydroxyl groups of the glucose rings were etherified. Similar correlations were established for the relationships between D.S. of the polymer and initial moduli and ultimate tensile strength of the films derived from the polymer. A systematic approach to preparing asymmetric membranes has been employed, based on a detailed understanding of the solution properties of ethyl cellulose. The raw data were taken from the literature, manufacturers bulletins, and augmented by laboratory experiments. Solubility parameters were used to devise a hypothesis for solvent combination requirements which would yield ethyl cellulose solutions capable of forming asymmetric membranes. (Kindley-Office of Saline Water)
W71-07832

PRACTICAL PROBLEMS IN COMBINING ELECTRIC POWER PRODUCTION WITH SEA WATER DESALINATION,
San Diego Gas and Electric Co., Calif.
For primary bibliographic entry see Field 08C.
W71-07833

DEVELOPMENT OF IMPROVED CELLULOSE ACETATE MEMBRANES,
Hercules, Inc., Cumberland, Md. Allegany Ballistics Lab.
Mark E. Cohen, Michael A. Grable, and Billy M. Riggleman.
For sale be the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $1.00. Office of Saline Water Research and Development Progress Report No 608, Sept 1970. 94 p, 26 fig, 29 tab. OSW Contract 14-30-2527.

Descriptors: *Desalination, *Membranes, Reverse osmosis, *Membrane processes, Osmosis.
Identifiers: Hollow fibers, Tubules, Skinned membranes, *Composite membranes, Cellulose esters, Ultrathin membranes, Membrane casting formulations.

The objectives of this program were to develop improved hollow-fiber membranes for reverse osmosis and to evaluate the best membranes developed in a bench-scale module. Both asymmetric and composite membranes were investigated. These studies produced a high performance asymmetric hollow-fiber membrane which operated successfully in modules with capacities up to 175 gpd. Substantial progress was also made toward preparing high-flux composite membranes. Composite membranes were prepared by directly coating cellulose nitrate shock gels with dilute chloroform solutions of cellulose triacetate and mixtures of cellulose triacetate and high-molecular-weight polyethylene glycols. The cellulose nitrate shock gels show outstanding promise as composite membrane substrates, being both highly porous and finely porous as well as exhibiting good mechanical properties. These composite membranes, in flat-sheet form, gave water flux rates approaching 20 gfd at a 90% sodium chloride rejection level, and 11 gfd at a 97% sodium chloride rejection level, when tested with a 0.5% sodium chloride feed brine at 1500 psi. Their performance in hollow fibers was lower, however, because of the much lower permeability of the hollow-fiber shock-gelled substrates. A 0.13 gfd flux rate and a 99.0% sodium chloride rejection were obtained in a composite hollow-fiber membrane with a 0.5% sodium chloride feed brine at 600 psi. Improvements in the fabrication of the cellulose nitrate shock-gelled hollow-fiber substrates should allow preparation of very high-flux composite hollow-fiber membranes. (Horowitz-Office of Saline Water)
W71-07834

REGENERATION OF CELLULOSE ACETATE MEMBRANES,
Aerojet-General Corp., El Monte, Calif.
P. A. Cantor, W. S. Higley, and C. W. Saltonstall, Jr.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $0.50. Office of Saline Water Research and Development Progress Report No 601, July 1970. 43 p, 8 fig, 10 tab, 1 ref. OSW Contract 14-01-0001-1815.

Descriptors: *Desalination, *Reverse osmosis, *Membranes, Cellulose, Osmosis, Membrane processes, Acids.
Identifiers: *Cellulose acetate, Acetic acid, Oxalic acid.

Several simple methods for in situ one-step regeneration of both flux and salt-retention properties of service-deteriorated membranes have been developed. Membranes have been successfully regenerated using hot, 4% acetic acid, and a one-step cleaning method effective at room temperature has also been developed. A promising process which combines cleaning and regeneration in one step, using 1% oxalic acid with 3% acetic, was demonstrated. (Mintz-Office of Saline Water)
W71-07835

SEAWATER CORROSION TEST PROGRAM - SECOND REPORT,
Dow Chemical Co., Freeport, Tex.
For primary bibliographic entry see Field 08G.
W71-07975

INVESTIGATION OF GALVANICALLY INDUCED HYDRIDING OF TITANIUM IN SALINE SOLUTIONS,
Battelle Memorial Inst., Richland, Washington. Pacific Northwest Labs.
For primary bibliographic entry see Field 08G.
W71-07976

DEVELOPMENT OF A CALIBRATION MODULE FOR TRACE OXYGEN ANALYZERS,
Aerojet-General Corp., El Monte, Calif.
For primary bibliographic entry see Field 08G.
W71-07977

NEW TECHNOLOGY FOR TREATMENT OF WASTE WATER BY REVERSE OSMOSIS,
Envirogenics Co., El Monte, Calif.
For primary bibliographic entry see Field 05D.
W71-07990

REVERSE OSMOSIS-A REVIEW OF ITS APPLICATIONS TO WASTE TREATMENT,
Ontario Research Foundation, Sheridan Park.
For primary bibliographic entry see Field 05D.
W71-08006

3B. Water Yield Improvement

A METHOD FOR CHARACTERIZING THE RUNOFF POTENTIAL OF RAINFALL IN WATER HARVESTING SCHEMES,
Hebrew Univ., Rehovoth. Faculty of Agriculture.
E. Rawitz, and D. Hillel.
Supported in part by US Dept of Agriculture, Soil and Water Conservation Div. Water Resources Research, Vol 7, No 2, p 401-405, Apr 1971. 5 p, 4 fig, 2 tab, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Arid lands, *Runoff forecasting, *Water yield, Water supply, Water balance, Data collections, Infiltration, Rainfall disposition, Rainfall intensity, Storm runoff.
Identifiers: *Runoff potential, *Israel.

A method is presented for evaluating the runoff-producing potential of rainfall patterns and for estimating the amount of water hypothetically obtainable from water harvesting areas of given average infiltration rates. Data obtained from the arid zone of Israel indicate that the distribution of rainfall amounts in relation to rainfall intensities is skewed toward the low intensities and that a few large storms generally account for most of the total rainfall and runoff producing potential. Scaling of rainfall intensity versus relative rainfall amount shows that seasons with widely different total rainfalls nevertheless have similar relative distribution patterns. This fact suggests the possibility of finding a function that can adequately characterize the relative intensity distribution pattern of a region and can be used to predict runoff potential in relation to seasonal rainfall probabilities. (Knapp-USGS)
W71-07913

CLOUD-SEEDING EXPERIMENT, TASMANIA, 22 DECEMBER 1966 TO 26 FEBRUARY 1969,
Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Radiophysics.
E. J. Smith, and E. E. Adderley.
Available from the National Technical Information Service as N70-43097, $3.00 in paper copy, $0.95 in microfiche. Commonwealth Scientific and Industrial Research Organization (CSIRO) 3rd Progress Report, Dec 1969. 102 p, 13 fig, 14 tab, 3 append.

Descriptors: *Cloud seeding, *Rainfall, *Silver iodide, *Artificial precipitation, Aircraft, Reviews, Meteorological data, Clouds, Winds, Air masses, Atmosphere, Weather.
Identifiers: *Australia (Tasmania).

A cloud seeding experiment conducted in Tasmania, Australia from December 1966 to February 1969 is described. Its main purposes were to determine the amount by which seeding clouds with silver iodide smoke released from an aircraft can increase precipitation in a hydroelectric catchment area, the circumstances in which the increases can be obtained and the duration of the effects. The seeding operation was carried out in alternate years only. On days when clouds are suitable for seeding, they are seeded in seeded periods but observed and not seeded in unseeded periods. Thus rainfall may be compared on two similar sets of suitable days, on one set of which clouds were seeded and the other not. No statistical bias is involved. Similarly, rainfall on seeded days of a given type may be compared with rain on unseeded days of otherwise similar type. Rainfall totals and ratios on seeded and suitable days, together with subdivisions by cloud type and air mass are tabulated. In 1968 seeding was successful in frontal and cyclonic air masses and with stratiform and indeterminate clouds in the west and cumuliform clouds in the east. (Woodard-USGS)
W71-07966

USU TELEMETERING PRECIPITATION GAGE NETWORK,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 02B.
W71-08131

TELEMETRY SYSTEM MODIFICATIONS AND 1968-69 OPERATION,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 02B.
W71-08132

3C. Use of Water of Impaired Quality

NATURAL LEACHING OF THE HIGHLY SALT AFFECTED SOILS OF WESTERN RAJASTHAN,
Public Health Engineering Lab., Jodhpur (India); Indian Grassland and Fodder Research Inst., Jhansi (India); and Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 02G.
W71-08071

A STUDY ON CHANGES IN QUALITY OF UNDERGROUND WATER,
Tabela House, Kota (India). Agricultural Chemistry Section.
For primary bibliographic entry see Field 05B.
W71-08073

RECLAMATION OF SALINE-SODIC SOILS IN THE UPPER COLORADO RIVER BASIN,
Colorado State Univ., Experiment Station, Grand Junction.
C. W. Robinson.
Colorado State University Experiment Station, Bulletin 535S, Mar 1968. 19 p, 11 fig, 1 tab.

Descriptors: *Reclamation, *Crop production, *Soil-water-plant relationships, *Drainage practices, *Irrigation practices, Salts, Alkaline soils, Saline soils, Saline water, Colorado, Electrical conductance, Gravels, Aquifers, Sodium compounds, Calcium compounds, Magnesium compounds, Chlorides, Sulfides, Leaching, Pumping, Irrigation efficiency, Water table, Wheat, Corn (Field), Rehabilitation, Treatment, Soil amendments, Crop response.

Below-average yields in arid and semi-arid lands may be due to accumulation of soluble salts and akaline soils. Sodic soils commonly become abandoned. The irrigated Grand Valley of western Colorado has 20,000 acres of below-average crop production. The Mancos Shale, parent material for soil, contains highly saline groundwater--electrical conductivity of 9.0 mmhos/cm in the shallow gravel aquifer, and more than 100 mmhos/cm in saturated soil pastes. Sodium, calcium, and magnesium chlorides and sulfates accumulate and may be leached to reclaim soils by additional irrigation. Soil amendments and salt tolerance are discussed. Pump drainage lowers the water table to reclaim soils efficiently. Pumping at 250 to 300 gallons per minute after 15 months lowered the water table about 2 feet in 150 to 200 acres with significant wheat and corn production improvement. Over irrigation and pump drainage proved a successful rehabilitation method for saline-sodic soils in the Upper Colorado River Basin. A table shows effects of leaching treatments on soluble salt content and exchangeable sodium percentages of soil. Ele figures show general topography of study area, t ical fields of reclaimed and abandoned la leaching effects, conductivities, yields and c response. (Popkin-Arizona)
W71-08146

BENEFICIAL USES OF WARM WAT DISCHARGES IN SURFACE WATERS,
Texas A and M Univ., College Station. Dept Wildlife Science.
Kirk Strawn.
In: Electric Power and Thermal Discharges; T mal Considerations in the Production of Elec Power. Gordon and Breach, New York, p 143-1 1971. 3 fig, 2 tab, 9 ref.

Descriptors: *Heated water, *Beneficial use, *I farming, *Thermal powerplants, Temperat Cultures, Catfishes, Trout, Swimming, Produc ty.
Identifiers: Food-conversion rates, Tempera choice tank.

Possible beneficial effects of heated surface w develop when water is too cold for optimum gro and food conversion rates of fishes during muc the year and assuming the ability of fishes to c to a more suitable temperature if the tempera becomes too high in the discharge vicinity. T perature choice tank and food-conversion rate dies revealed that the best temperature for cha catfish is 29C. Power plants could also m chilled rivers fit for swimming or provide he water as a refuge for fishes during cold weathe ..)))—ACRE RESERVOIR IN Texas suppl cooling water for a power plant could produce crops of 2,000,000 pounds each worth a tot $1,600,000 leaving the plant with a first year profit of $705,150 less interest and taxes. (See W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08304

UTILIZING WASTE HEAT FOR URI SYSTEMS,
Westinghouse Corp., Philadelphia, Pa. Envi mental Systems Dept.
J. A. Nutant.
In: Electric Power and Thermal Discharges; T mal Considerations in the Production of Ele Power. Gordon and Breach, New York, p 417- 1971.

Descriptors: *Heated water, *Beneficial *Thermal powerplants, *Air conditioning, *A tion, Condensers.
Identifiers: *Waste heat utilization, Greenho Refrigerating systems.

Assuming a 1000 Mw design nuclear power p providing electricity and heating and air condi ing by extracting steam at 220F from the po plant to drive the lithiumbromide refrigera system, a population of approximately 450 could be served. Another concept investigated the use of the condenser discharge for an aera system. The system suggested is the injectio pure oxygen into the river. Sewage plant-po combinations have also been taken under sideration. Waste heat could be utilized to de and de-fog airports. Greenhouse heating woul an economical way to use waste heat. A 1000 plant could heat 4.4 sq. miles of greenhouse. also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08316

3E. Conservation in Industry

THE CARACAS WATER UTILITY: OVER APPRAISAL,
National Inst. of Sanitary Works (Venezuela); Ministry of Public Works, Caracas (Venezuela
For primary bibliographic entry see Field 06C.
W71-07753

F. Conservation in Agriculture

FFECT OF WATER AVAILABILITY ON HOTOSYNTHESIS OF PLANTS,
inois Univ., Urbana. Water Resources Center.
S. Boyer.
ermination Report, Feb 1970. 13 p. OWRR Proct A-028-ILL (2).

escriptors: *Plant moisture, *Photosynthesis, Irgation, Chloroplasts, Drought, *Irrigation effiency, Corn, Soybeans, *Consumptive use.

griculture is the largest consumptive user of water this country, but irrigation is generally planned th little knowledge of the need of the crop for ter. A method is described for determining the oisture status of corn and soybeams and it apars that it may be constructed more economilly than previously thought. The technique is sed on pressure that it applied to individual aves. It was studied in conjunction with measureents of photosynthesis which showed that it is ssible to predict how photosynthesis is affected drought with measurements using the instruent. In corn and soybeans, photosynthesis was afcted when water was still relatively available to crop and well before any signs of drought were ible. Therefore it is important to be able to mea-re the moisture status of corn and soybeans for aximum yield. Chloroplasts were also isolated m leaves which had been desiccated to varying grees in order to determine whether drought afcts photosynthetic activity at the subcellular el. Inhibition of activity was found in both sunwer and pea chloroplasts as the leaves became siccated. The inhibition occurred at desiccation els which are common during drought.
71-07703

GH PLAINS IRRIGATION AND TEXAS ATER PLAN,
xas Technological Coll., Lubbock.
r primary bibliographic entry see Field 06D.
71-07740

ADING INVERTED PYRANOMETERS AND EASUREMENTS OF RADIATION FLECTED FROM AN ALFALFA CROP,
braska Univ., Lincoln.
r primary bibliographic entry see Field 07B.
71-07812

E GREAT SISAL SCHEME,
nter College, New York City, Anthropology Detment.
niel R. Gross.
tural History, Vol 80, No 3, p 48-55, Mar 1971. fig, 1 tab.

scriptors: *Semiarid climates, *Social impact, ber crops, *Ecology, *Economic impact, oughts, On-site investigations, History, Crop ponse.
ntifiers: *Northeastern Brazil, *Sisal, *Human logy.

e sertao of northeastern Brazil is a semiarid rn scrub region where crop and cattle produc- prevail. In drought years, agricultural produc- is minimal and large numbers of people must rate out of the region. In most years, until ently, nutritional levels were reasonable quate for the peasant laborer population, which w beans, squash and manioc on their small landdings. Since 1951, sisal has become an increasy important crop, so that in the last decade an rwhelming percentage of small landholders had un growing it. Sisal is a highly drought resistant t whose broad leaf contains a cellulose core ch may be twisted into twine and rope. ough easily cultivated, the plant requires high uts of labor for weeding, without which a field omes choked and unreclaimable. Between 1951 962, world market prices were extremely high the majority of peasants abandoned food crops for sisal. This resulted in a precipitous drop in food production and the region became a net food importer. A small group of prosperous entrepeneurs developed, who were involved in sisal processing or food shops. Since 1962, sisal prices have plummeted and small growers have had to abandon their fields and work for processors. On-site investigations have shown that for the majority, nutritional levels have decreased. Progress has come to only a few, while most people have become more impoverished. This illustrates the necessity for an ecological approach in all agricultural economic planning. (Casey-Arizona)
W71-07813

ONION SEED PRODUCTION IN YUMA COUNTY,
Agricultural Research Service, Tucson, Ariz.
Don R. Howell, and G. D. Waller.
Progressive Agriculture in Arizona, Vol 23, No 1, p 10-11, 16, Jan-Feb 1971. 3 fig.

Descriptors: *Onions, *Seeds, *Crop production, *Limiting factors, *Crop response, Arizona, California, Risks, Cultivation, Fertilization, Nitrogen, Phosphate, Irrigation practices, Pretreatment (Water), Plant growth regulators, Herbicides, Weed control, Pest control, Profit, Economic feasibility, Planting management, Field crops.
Identifiers: *Seed production, *Crop failures, *Pollinators, Honey-bee colonies, Yuma County (Ariz).

'Short-day' onion seed production is most successful in areas with warm, sunny, squall-free days such as prevail at Yuma, Arizona, though even here seeds are high-risk crops. Under proper conditions, however, seed production in Yuma County can be a profitable operation. Seed cultivation methods are discussed in this investigation of crop failures in Yuma County in 1969 and 1970. Side dressing and water-run fertilization by nitrogen and phosphate follow planting, though preplanting fertilization is practiced. Pre-irrigation occurs during early fall, and winter irrigation in seed-to-seed fields is withheld to 'shock' seeds to bulb. Some irrigation of bulb-to-seed fields resumes in December and January. A spring irrigation delay increases growing rate. Herbicides are used to control weeds and pests. Honey bee colonies serve as pollinators. Specially adapted combines facilitate harvesting. Plant disease control during cool-wet years needs further study, as does more adequate pollination because of the preference for honey bees of desert plants having the same blooming period as the onion plants. (Popkin-Arizona)
W71-07818

WHEAT IRRIGATION AFFECTS FLOUR YIELD AND QUALITY,
Arizona Univ., Tucson; and Arizona Agricultural Experiment Station, Tucson.
A. D. Day.
Progressive Agriculture in Arizona, Vol 23, No 1, p 3, 16, Jan-Feb 1971. 1 tab.

Descriptors: *Wheat, *Irrigation effects, *Gains (Crops), *Feeds, *Crop production, Arizona, Proteins, Viscosity, Limiting factors, Crop response, Soil moisture, Moisture stress, Moisture uptake, Mixing, Field crops.
Identifiers: *Flour production, *Flour quality, *Milling, *Mixing curve peak, *Mixing curve area, Baking, Gluten.

Wheat production, for grain used for milling or livestock feed, has increased in Arizona. Yield, protein, alkaline water retention capacity, viscosity, mixing curve peak and area were investigated to evaluate irrigation effects on milling and baking quality of flour. Large yield reductions occurred when water was withheld at jointing. Highest protein was produced when plants were water stressed. Highest alkaline water retention capacity was found when moisture was withheld at jointing. High flour viscosity and stronger gluten occurred when soil moisture was withheld. Water stress at dough stage required longer time to reach flour mixing curve peak. Moisture stress decreased mixing curve area significantly. Flour protein content variations produced proportional viscosity and mixing curve area changes. (Popkin-Arizona)
W71-07819

WATER RESOURCES AND IRRIGATION DEVELOPMENT IN THE MIDDLE EAST,
Keble Coll., Oxford (England). Dept. of Geography.
C. G. Smith.
Geography, Vol 55, No 249, p 407-425, Nov 1970. 8 fig, 1 tab, 21 ref.

Descriptors: *Water resources, *Water resource development, *Arid lands, *Regional analysis, *Irrigation programs, Dry farming, Geographical regions, Social aspects, Political aspects, Economic feasibility, Temperature, Seasonal, Rainfall, River basins, River flow, Soil moisture, Precipitation (Atmospheric), Competing uses.
Identifiers: *Middle East, *Mediterranean climates, *Potential evapotranspiration.

The Middle East is arbitrarily defined as Egypt and southwest Asia, excluding Afghanistan. Two types of climate occur in the area, arid and semiarid, which are undifferentiable in terms of human geography, and Mediterranean climate involving winter rainfall at relatively low temperatures. The latter type of climate permits some soil moisture storage, enabling extensive dryland farming. Everywhere else agriculture is practiced only in river basins where extensive irrigation is possible or in those rare regions of high rainfall. Today, the overwhelming population majority lives in the irrigated areas. In the Mediterranean climatic areas, aridity increases southwards and eastwards, while precipitation increases with elevation. Rivers having their source regions within the Middle East have a high ratio of runoff to precipitation. Potential evapotranspiration data indicate that regions of annual water surplus are relatively rare. For the Middle East as a whole, 9% of the total land area is cultivated (25% of which is irrigated) and another 8% is potentially cultivatable. Water resource development must take place within rigid limitations and therefore has the greatest potential in river basins where potential crop productivity is the highest. Several major river irrigation projects are outlined: the Tigris and Euphrates, within Syria, Iraq and Turkey, the Jordan-Yarmuk, within Jordan and Israel and the Nile, within Egypt. It is shown that required capital is available and much can be done, but that political and social problems in the area present major obstacles to development. (Casey-Arizona)
W71-07822

RETURNS FROM DRYLAND FARMING IN THE TRIANGLE,
Montana Agricultural Experiment Station, Bozeman. Dept. of Agricultural Economics and Rural Sociology.
M. E. Quenemoen, and Robert F. Bucher.
Montana Agricultural Experiment Station, Bulletin 626, Apr 1969. 40 p, 33 tab, 33 ref.

Descriptors: *Dry farming, *Return (Monetary), *Evaluation, *Economic efficiency, *Farm management, Salvage value, Assets, Montana, Economic prediction, Market value, Land resources, Income analysis, Employment opportunities, Wheat, Prices, Cost analysis, Profit, Harvesting, Budgeting, Constraints, Unit costs, Acreage, Analysis, Farm prices, Farm units.
Identifiers: Triangle Area (Mont), Great Falls (Mont), Havre (Mont), Shelby (Mont), Big Sandy (Mont).

This study evaluates returns from dryland farming in the Great Fall, Havre and Shelby area of Montana to determine if they are adequate to pay going market prices for land and if they give operators returns equal to non-farm employment. Wheat is the principal crop. Cost returns are based on the

difference between aquisition (asset price plus cost of acquisition, or total cost to buyer) and salvage (asset price minus marketing cost, or net receipts to a seller) values. Factors which influence farm operation beside maximum profit are outlined. Farms are classified according to 4 harvesting sizes - 400, 900, 1500, and 2400 acres. Budgets are developed from 16 farms near Big Sandy, supplemented by agricultural engineering reports. Returns to operators, based on acquisition values, were -$225, -$292, -$279, and $3368 for the 400-, 900-, 1500-, and 2400-acre farms. Returns to operators, based on salvage values were $1407, $3118, $5370, and $11711 for the 400-, 900-, 1500-, and 2400-acre farms. Dry-land farming returns are particularly unfavorable to young farmers who have higher potential returns in non-farm employment. Internal pressures operating to favor returns on farm enlargement are (1) rapidly decreasing unit costs as farms increase toward 900 acres, (2) greater net income from larger acreage, and (3) excess machinery capacity on smaller farms. Appendixes describe and summarize farm budgets for the 4 acreage sizes. Thirty-three tables compare costs, returns, models, land and machinery values, and capital investments. (Popkin-Arizona)
W71-07823

AGGREGATE SUPPLY RESPONSES FOR EASTERN COLORADO WHEAT FARMERS,
Economic Research Service, Washington, D.C. Farm Production Economics Div.; and Colorado State Univ., Fort Collins. Dept. of Economics.
Harry G. Sitler, and Melvin D. Skold.
Colorado State University Experiment Station, Technical Bulletin 104, Apr 1969. 55 p, 45 tab, 3 fig.

Descriptors: *Dry farming, *Limiting factors, *Soils, *Precipitation (Atmospheric), *Return (Monetary), Colorado, Wheat, Crop production, Harvesting, Pastures, Acreage, Farm management, Cost allocation, Labor, Capital, Livestock, Farm prices, Supply, Computer programs, Grains (Crops), Budgeting, Economic efficiency, Income.

Precipitation and soils are the most important factors limiting wheat production, the best adapted cash crop, in eastern Colorado. Average annual precipitation ranges from 13 to 19 inches. Nonirrigated cropland soils are heavy or sandy. Wheat is adapted to this area because it can be produced under dryland conditions. Wheat cropland is about 6,857,050 acres. Eastern Colorado is divided into 5 adjustment areas based on (1) wheat percentage harvested, (2) wheat yield per planted acre, and (3) cropland to pasture ratio. Data on soil, precipitation, crop activities and yields, machinery costs, labor and capital availability, livestock activities, and prices were collected. Supply responses were developed from historical records and computer linear programming. Responses are discussed and compared as low, low-medium, medium, high-medium, and high feed grain prices. Supply responses were greatest for medium feed prices. Farmer response to price change depends on many factors. Crop and livestock enterprise budgets, developed for major precipitation zones, show costs and outputs. Tables and figures include wheat response curves, and economic data for the 5 adjustment areas. (Popkin-Arizona)
W71-07827

AGRICULTURAL FLAMING FOR INSECT AND WEED CONTROL IN COLORADO,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
Ralph W. Hansen, and Robert G. Simpson.
Colorado State University Experiment Station, Bulletin 538S, Dec 1969. 9 p, 3 tab, 7 fig, 3 ref.

Descriptors: *Insect control, *Weed control, *Lethal limit, *Water yield improvement, *Burning, Water conservation, Insects, Weeds, Colorado, Evaluation, Soil moisture, Alfalfa, Chlorinated hydrocarbon pesticides, Life cycles, Insect behavior, Crop production, Sugar beets, Irrigation ditches, Costs, Water utilization, Larvae, Ditch grass, Hazards, Breeding.
Identifiers: *Weevils.

The effectiveness of flame treatment to control insects and weeds is evaluated at the Colorado State University Experiment Station. Weeds not only use soil moisture, but provide breeding grounds for insects which infest irrigated crops. Flaming treatment is an alternative to chlorinated hydrocarbons, which present health problems by residue. Life cycle and habits of weevil are discussed. Flaming brings weevils to lethal temperatures at 200 degrees F. Only limited success was achieved from 1964 to 1968. An extensive 1968 field study by alfalfa growers did not show flaming to be effective against weevils. Flaming controls weeds when heat application is adequate to rupture plant cells. Weed control was most effective during dry periods with no wind. Flaming on yield and sugar content of sugar beets was found to be an effective weed control. Flaming to control weeds along irrigation ditches is an established Colorado practice. Such control is possible at low cost with no residue danger, and good trash elimination. Water is used efficiently with less loss in clean ditches where weed seed distribution is reduced. Figures show extent of weevil infestation in the United States, adult and larvae weevils, pupation within cocoon, plot experiments and hooded flamer. Tables show effect of flaming on yield, weed content, protein content, sugar beet yield, sucrose content, and ditch flaming costs. Ditch flaming costs at Arkansas Valley Branch Station for single burning of 6-foot width from 1963 to 1967 ranged from $5.46 to $8.17 per mile. (Popkin-Arizona)
W71-07828

RESOURCES, COSTS AND RETURNS ON CATTLE RANCHES IN THE MOUNTAIN AREAS OF COLORADO BY SIZE OF RANCH,
Colorado State Univ., Fort Collins. Dept. of Economics.
C. Alan Nelson, and Melvin D. Skold.
Colorado State University Experiment Station, Technical Bulletin 101, Mar 1969. 45 p, 14 tab, 1 fig.

Descriptors: *Resources, *Costs, *Return (Monetary), *Cattle, *Range management, Mountains, Colorado, Ranges, Livestock, Evaluation, Analysis, Resource allocation, Economic efficiency, Irrigated land, Water management (Applied), Flood irrigation, Gross income, Operating costs, Resource development, Productivity.
Identifiers: *Resource management, *Beef production.

A 6-county mountainous area in Colorado was evaluated in terms of resources, costs and returns on cattle ranches by 40 interviews. About 85% of the ranchland is irrigated, and more than 90% of the ranches have irrigation. Livestock production of feeder calves is the predominant enterprise, where private and/or public rangeland provide summer feed, and irrigated meadows provide winter feed. Management and allocation of water on native hay meadows, generally by flood irrigation, is essential to proper range production. Five ranch sizes (74, 181, 254, 321, and 764 animal units) do not differ in productivity. Beef production, sales, and gross income are proportional to resources employed because of the extensive nature of ranching. The 181-and 254-animal units spend less per pound of beef produced than the 74, 321, and 764 units. Cash costs are the largest costs. Productivity index, and production per unit of input has not increased as rapidly as the index of operating expense per production unit. None of the ranches analyzed are making economically adequate returns. Resource adjustment and management may increase ranch income. Detailed analyses of resources allotment will be considered in future studies. Fourteen tables summarize pertinent resource, cost and returns data. (Popkin-Arizona)
W71-07829

THE ECONOMICS OF CROPPING SYSTEMS FOR WESTERN COLORADO,
Economic Research Service, Washington, D.C. Farm Production Economics Div.
C. Kerry Gee, and C. W. Robinson.
Colorado State University Experiment Station, Bulletin 539S, Dec 1969. 34 p, 21 tab, 4 ref, 1 fig.

Descriptors: *Economic efficiency, *Evaluation, *Analysis, *Rotations, *Farm management, Colorado, Consumptive use, Irrigation practices, Crop production, Alfalfa, Corn (Field), Grain (Crops), Sugar beets, Barley, Profit, Computer programs, Average prices, Farm prices, Risk, Labor, Capital costs, Budgeting, Pricing, Selectivity, Planning, Income.

The economics of consumptive use and irrigation water requirements are evaluated for cropping patterns in western Colorado. A cropping system consists of a single crop grown continuously or a combination of crops grown in sequence or rotation. A rotation consisting of alfalfa for 3 years followed by corn for grain, sugar beets and barley as a nurse crop is the most profitable rotation tested. Analysis is based on linear programming, using average prices. Profits were maximized on rotation schemes when sugar beet prices were from $14.13 and $16.17 per ton, and when corn prices did not rise above $2.74 per cwt. Combining crop and livestock enterprises frequently increases farm profits. Farm managers should consider price risks, labor, capital investments, financial risks, livestock, and cropping patterns. Budgeted cropping systems, optimum cropping systems with and without livestock, changing prices, and cropping-system selection are discussed. A figure shows optimum rotations with various sugar beet and corn prices. Twenty-one tables show prices, assumptions, budgets, optimum enterprise combinations, and cost and production. (Popkin-Arizona)
W71-07830

DRILLING TEST HOLES FOR IRRIGATION WELLS.
For primary bibliographic entry see Field 04B.
W71-07922

PROBLEMS OF WATER SUPPLY FOR AGRICULTURAL OPERATIONS IN LOWER WEST BENGAL,
Calcutta Univ. (India).
K. Bagchi, and R. Bhattacharyya.
Indian Geohydrology, Vol 5, No 1, p 90-93, Dec 1969. 4 p, 1 tab, 4 ref.

Descriptors: *Water supply, *Floods, *Drought, *Hydrologic data, *Planning, Water resource development, Water management (Applied), Data collections, Statistics, Precipitation (Atmospheric).
Identifiers: *India, West Bengal (India).

An attempt is made to interpret the precipitation data of Lower West Bengal (india) for the last 70 years in terms of water availability and the periodicity of supply. A study of the actual rainfall for the period (1891 to 1950) reveals that for the region as a whole the chances of experiencing extremely heavy rainfall (above 1905 mm) is much less than its experiencing scanty rainfall. Except for the western part, the region is not only a lowland but also carries several channels which bring water from regions lying outside the study area. Abnormalities caused by excess rainfall beyond the region, both simultaneously and in periods when the channels are full, may play havoc with the standing crops. (Knapp-USGS)
W71-08099

METEOROLOGY AND THE MIGRATION OF DESERT LOCUSTS: APPLICATIONS OF SYNOPTIC METEOROLOGY IN LOCUST CONTROL,
World Meteorological Organization, Geneva (Switzerland).
R. C. Rainey.

orld Meteorological Organization, Technical ote 54, WMO No 1388, TP 64, Anti-Locust lemoir 7, 1963. 109 p, 3 plates, 24 fig, 2 tab, 1 p, 631 ref.

escriptors: *Arid lands, *Insects, *Meteorology, nsect behavior, *Weather patterns, Insect con-ol, Foreign countries, Meteorological data, inds, Migration, Maps.
entifiers: *Desert locusts, *Africa, *Asia, *Crop mage.

esert locust crop destruction is still a serious oblem in more than 30 countries of arid or semi-id Africa and southeast Asia. Huge amounts of ant material are consumed by migrating swarms, d many tons of dead locusts can be recovered by ensive airplane-spraying of a concentrated arm. Displacement of swarms in relation to eteorological factors encountered in migration n aid in forecasting locust attacks. Movements of grating locusts appear to be greatly influenced lowlevel windfields which they encounter. Many tailed maps, graphs, and photographs show arm movement, meteorological factors encoun-ed, orientation of individuals within swarms, and cations and times of egglaying in relation to the pearance of young swarms. (Yensen-Arizona)
71-08133

ATER IN THE DESERTS,
ah State Univ., Logan. Coll. of Engineering.
r primary bibliographic entry see Field 06B.
71-08134

LTERNATIVE USES OF ARID REGIONS,
inistere du Developpment Industriel et Scien-que, Paris (France). Direction du Gaz et de lectricite.
r primary bibliographic entry see Field 06D.
71-08135

GRICULTURAL PRODUCTION IN IR-GATED AREAS,
ah State Univ., Logan.
ynne Thorne.
esented at an international conference, 'Arid nds in a Changing World', Tucson, Arizona, ne 1969. In: Arid Lands In Transition, Dregne, H ed), p 31-56, Pub No 90, AAAS, 1970. 5 tab, 17 .

escriptors: *Agriculture, *Crop responses, *Ir-ation programs, *Arid lands, *Economic ects, Soil groups, Water resources development, reign lands, Irrigation practices, Irrigation ef-ts.
entifiers: *Developing nations.

id lands present many benefits to potential ricultural efforts. The limited leaching over time ves most of these regions rich in nutrients, ex-ting N. The lack of precipitation facilitates a ecisely timed, diversified irrigation agriculture ce rainfall often disrupts farm operations. It is gued that while arid land development involves h costs, the traditional considerations of cost-nefit analyses are inadequate criteria. Present ta indicate that 22% of all potentially arable land the world is in arid or semiarid climatic zones. st of this involves desert and nonvolcanic brown l groups. Of the 56 nations inventoried, an erall average of 14% of total arable land is ir-ated. A weighted average of estimated develop-nt costs was 980 dollars per ha., with irrigation uipment adding 250 or more dollars per ha. The oblems of irrigated agriculture are discussed for veral selected arid regions. The western W.S. has en experiencing spiralling population increases ich may greatly affect land uses, water consump-n priorities and public land priorities. However, ecise predictions are not yet possible. Problems the Middle East, North Africa, West Pakistan, dia and Australia are also discussed in some tail. The Indian practice of spreading available igation water as thinly as possible over extensive croplands brings out the basic question of limited vs. adequate water application. While it is stressed that there is no universally applicable answer, much research indicated productivity/unit of land or labor is greater in intensive water use situations. A critical problem in developing nations is the layering of expensive irrigation investments over traditional farm management practices. Also, construction promoters have too long been a dominating force in irrigation development. (Casey-Arizona)
W71-08137

ECONOMICS OF LAND AND WATER USE,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 06B.
W71-08138

EVALUATION OF CLIMATOLOGICAL RECORDS FOR RATIONAL PLANNING OF LIVESTOCK SHELTERS,
Department of Agriculture, Columbia, Mo. Livestock Engineering and Farm Structures Research Branch; and Environmental Science Services Administration, Columbia, Mo.
Leroy Hahn, and James D. McQuigg.
Agricultural Meterology, Vol 7, No 2, p 131-141, Mar 1970. 5 fig, 5 tab, 12 ref.

Descriptors: *Livestock, *Meteorological data, *Farm management, *Model studies, *Forecasting, Optimization, Efficiencies, Economic prediction, Economic feasibility, Productivity, Structures.
Identifiers: *Livestock shelters.

The most efficient relationships between livestock yield, weather, and climate, allow animals to maintain normal body temperature without decreased production or increased feed intake. Climatological records can be evaluated to determine the feasibility of erecting livestock shelters. By a system of calculating the probability of the frequency of a certain weather event, and measuring that event's effects on production, the profitability of erecting shelters can be estimated. Weather records and probability values for sixteen United States stations are used as examples. The most extensive application of this system is in milk production of dairy cattle, but modification of the system for egg production is underway. (Yensen-Arizona)
W71-08144

RECLAMATION OF SALINE-SODIC SOILS IN THE UPPER COLORADO RIVER BASIN,
Colorado State Univ., Experiment Station, Grand Junction.
For primary bibliographic entry see Field 03C.
W71-08146

EVALUATIONS OF GRASSES, LEGUMES, AND GRASS LEGUME MIXTURES FOR IRRIGATED PASTURES GRAZED BY SHEEP UNDER VARIOUS FERTILITY AND MANAGEMENT PRACTICES,
Agricultural Research Service, Flagstaff, Ariz. Crops Research Div.
F. B. Gomm.
Montana Agricultural Experiment Station, Bulletin 618, Feb 1969. 34 p, 21 tab, 14 fig, 14 ref. Experiment Station Project M.S. 826.

Descriptors: *Grasses, *Legumes, *Varieties, *Rotations, Pastures, Irrigated land, Grazing, Sheep, Fertility, Management, Montana, Crop response, Soil structure, Productivity, Erosion control, Performance, Soil properties, Environmental effects, Nitrogen, Return (Monetary), Carrying capacity, Weight, Crop production, Forages, Proteins, Phosphorous, Calcium, Alfalfa, Winter killing, Orchard grass.

Many irrigated croplands in Montana were converted to 206,000 acres of irrigated pasture from 1954 to 1961. Grazing rotation is an important management policy to maintain soil structure and production, and control erosion. This report summarizes the performance of several grasses and legumes alone and in combination with sheep grazing in irrigated pasture: (1) Results from 3 years of grazing legumes, grasses and mixtures, (2) conclusions from 5 years simple and complex mixtures, (3) summary of grazing on a fertilized pasture, and (4) results of 3 year management studies on 3 pasture mixtures. Irrigated mixtures should consist of one grass and one legume, where selected species meet management needs, soil conditions, and other environmental characteristics. Nitrogen fertilization of grass pastures gives economical returns in carrying capacity, weight gains, and herbage yields, though management practices influence pasture productivity. The reliability of animal-weight-change method of determining total digestible nutrients is questioned. Lambs use pastures more efficiently than yearling ewes for gains. Legume percentage and protein content of herbage fluctuates, though phosphorous and calcium decrease in older pastures. Alfalfa-grass pastures are susceptible to winter kill and may cause bloating. Birdsfoot trefoil and orchardgrass are excellent legume and forage. Tables and figures quantify these results. (Popkin-Arizona)
W71-08147

PANHANDLE RESEARCH STATION PROGRESS REPORT - 1969, GOODWELL, OKLAHOMA.
Oklahoma State Univ., Goodwell. Agricultural Research.

Oklahoma State University Agricultural Research, Progress Report p-620, Sept 1969. 60p.

Descriptors: *Soil-water-plant relationships, *Irrigation practices, *Water management (Applied), *Crop response, *Dry farming, Oklahoma, Frost, Great Plains, Research and development, Varieties, Field crops, Forages, Fertility, Planting management, Plant populations, Wheat, Crop production, Sorghum, Grains (Crops), Soil moisture, Nitrogen, Barley, Grazing, Fertilizers, Irrigation efficiency, Climatic data, Field capacity, Corn (Field).
Identifiers: *Progress reports, *Panhandle Agricultural Experiment Station, Semiarid lands, Green bug, Residue, Infestation, Buffalo grass, Row spacing, Multicrop patterns, Rye, Crop failure.

The Panhandle Agricultural Experiment Station, in the semiarid high plains (Great Plains) of Oklahoma, has 43 acres of land for irrigation and dryland research. Field crop varieties, forages, fertility, residue management, plant population, and water management are studied. A late Spring freeze lowered wheat yields, and green sorghum reduced grain production in 1968. Results of 22 1968-69 projects are presented. These include irrigation research on small grains wheat fertility, moisture and nitrogen in wheat, moisture and buffalograss sod, row spacing, and multicrop patterns. Ryes produce a greater yield than wheats or barley for grazing grains. Irrigated wheat can be nitrogen fertilized economically in the plains. Greatest water-use efficiency by wheat occurs with lowest moisture level. Long-term climatic conditions are reflected in soil-moisture regime. The 40-inch row spacing of irrigated sorghum made poor use of field capacity. A wheat crop failure can be expected one-third of the time regardless of the management system. Corn and grain sorghum can successfully be produced after irrigated wheat. Expanding agriculture in the high plains justifies this research. Most of the studies are continuing. (Popkin-Arizona)
W71-08149

BREAKTHROUGH SOUGHT IN GRAIN SORGHUM PRODUCTION,
Nebraska Univ., Lincoln. Dept. of Sorghum Physiology; and Agricultural Research Service, Lincoln, Nebr.
Jerry D. Eastin, and Grant I. Johnson.

University of Nebraska, College of Agriculture and Home Economics, Quarterly, Vol 14, No 4, p 4-7, Winter 1968. 4 fig.

Descriptors: *Sorghum, *Crop production, *Plant growth regulators, *Environmental effects, *Limiting factors, Grains (Crops), Nebraska, Photosynthesis, Translocation, Respiration, Crop response, Synthesis, Carbon dioxide, Light, Energy, Proteins, Efficiencies, Heat, Moisture stress, Instrumentation.

Grain sorghum is a commonly and economically important crop in Nebraska, and arid and semiarid lands. Economic and nutritious yields are the result of complex factors such as photosynthesis, translocation, respiration, and associated synthesis of grain storage products. Photosynthesis is the conversion of carbon dioxide and light energy to starch and protein. Photosynthesis efficiency is related to heat and moisture stress. Translocation is the migration of starch and protein to the head of the plant. Respiration and synthetic activities include energy production from stored protein and starch, and production of protein and starch from energy. Environmental stresses, such as heat and moisture extremes, require detailed investigation. Most plants have some tolerance to heat or drought, but not necessarily to both. Complex instrumentation is necessary to measure coordinated plant processes. Plant breeders would make rapid progress in increasing production if they knew the limiting factors, and their order of importance over various conditions. Such knowledge is the topic of future research. Figures show increases in Nebraska sorghum acreage and yield, radioactive isotope tagging of sorghum, and sorghum head. (Popkin-Arizona)
W71-08151

RE-USING IRRIGATION RUNOFF,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering and Natural Resources.
P. E. Fischbach, H. D. Wittmuss, and J. F. Decker.
University of Nebraska, College of Agriculture and Home Economics, Quarterly, Vol 14, No 4, p 15-16, Winter 1968. 3 fig.

Descriptors: *Water reuse, *Runoff, *Irrigation practices, *Water conservation, *Water management (Applied), Reservoir storage, Rainfall, Nutrients, Irrigation efficiency, Furrows, Piping systems (Mechanical), Cost comparisons.
Identifiers: Community risks, Underground pipe.

Irrigation runoff, which may constitute 20 to 40% of the water applied by conventional surface systems, can be saved by a re-use system which collects runoff at furrow ends, delivers it to the same or adjacent field from a small sump, dugout or reservoir. The storage reservoir is the heart of this system. Runoff from irrigation and rainfall can be salvaged this way. Re-using runoff would save water, labor and plant nutrients, and maintain high irrigation efficiency. Large furrows are more effective than small ones. Underground pipes may be used to redistribute the salvaged water. The cost of re-use water is about $4 per acre foot, which is equivalent to a 50-foot lift on an irrigation well. Reuse of runoff may reduce water costs, labor requirements, and community risks. Photographs show a sump, dugout, dam and pond for runoff reuse. (Popkin-Arizona)
W71-08152

PASTURE IMPROVEMENT THROUGH EFFECTIVE WEED CONTROL,
Agricultural Research Service, Lincoln, Nebr.
For primary bibliographic entry see Field 04A.
W71-08153

THE EFFECTS OF SALINITY STANDARDS ON IRRIGATED AGRICULTURE IN THE COLORADO RIVER BASIN,
Federal Water Pollution Control Administration, Boulder. Colorado River - Bonneville Basins Office.
For primary bibliographic entry see Field 05G.
W71-08222

SALINITY CONTROL IN RETURN FLOW FROM IRRIGATED AREAS - A DEMONSTRATION PROJECT,
Colorado State Univ., Fort Collins. Natural Resources Center.
For primary bibliographic entry see Field 05G.
W71-08225

RURAL-AGRICULTURAL WATER SUPPLY SYSTEMS: IRRIGATION,
Department of Agriculture, Washington, D.C.
Clifford Dickason, and Howard Hill.
In: Public Facility Needs, Washington, DC, 1966, p 125-136.

Descriptors: *Irrigation, *Water supply, *Investment, Costs, Lakes, Streams, Reservoir, Groundwater, Canals, Capital, Cost, Financing, Taxes, Government, Water resource development, Forecasting.
Identifiers: *Public facilities, Conveyance systems, User charges.

A survey was made of irrigation water supply systems that are either public facilities or group facilities operated by various types of irrigation water organizations such as mutual irrigation organizations, commercial water suppliers, irrigation districts, the Bureau of Reclamation, the Bureau of Indian Affairs, and certain states and cities. The nature and composition of irrigation facilities is presented with a description of the facilities and a discussion of existing capital plant in the U.S. This includes growth, ownership proportions and current economic value of the facilities. Construction, operation, and maintenance costs are presented, together with user charges. The trend of capital outlays is cited by accounting for new investment in irrigation, proportions of capital outlay by organizations, and various means of financing. Finally, a projection is made, extending to 1975, of changes in irrigated acreage and development that accounts for both Federal and non-Federal investment in the development of the irrigation aspect of water resources. (See also W71-08281) (Murphy-Rutgers)
W71-08288

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

SPILLWAY AND SLUICES, ALLEGHENY DAM, ALLEGHENY RIVER, PENNSYLVANIA AND NEW YORK. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07801

FLOW CHARACTERISTICS IN FLOOD-CONTROL TUNNEL 10, FORT RANDALL DAM, MISSOURI RIVER, SOUTH DAKOTA. HYDRAULIC PROTOTYPE TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07802

STABILITY OF SOUTH JETTY SIUSLAW RIVER, OREGON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07806

FLOOD CONTROL PLANNING IN ARIZONA,
Corps of Engineers, Los Angeles District, Calif.
Alan Chapman.
Proceedings, 14th Annual Arizona Watershe Symposium, Phoenix, Sept 23, 1970, p 20-2 1971. 4 fig.

Descriptors: *Planning, *Flood control, *Arizon *Land use, *Channel improvement, Non-structur alternatives, Flood plains, Flood plain zonin Waterproofing, Water conservation, Geographic regions, Federal government, Inter-agenc cooperation, Arid lands, Regional analysis, Vegeta tion, Economic feasibility, Cost-benefit analysi Environmental effects.
Identifiers: *US Army Corps of Engineers.

The Army Corps of Engineers is described as federal agency dedicated to improvement of na tional water resources. The Corps is aware of en vironmental problems associated with its projec and hopes to achieve balanced programs throug cooperation with other involved federal, state an local agencies, surveys involving regional growt and future regional needs and studies of alternat approaches to given problems. A number o proposed and actual studies of Corps flood-contro planning work are described for Arizona. A stud of the Rillito Creek near the city of Tucson is ou lined in detail. The creek and its tributaries co stitute a flood plain which effects much of th groundwater recharge of the area. Although th area is sparsely populated, periodic floods caus much damage. A regional study involving vegeta tion, soils and local land use and population trend was undertaken in cooperation with local interest The aim was to insure that environmental factor were included in the overall planning process. was concluded that only channel improvements t control a discharge of 24,000 cubic feet/sec., flood frequency of once in 50 years, were economi cally feasible. At a public hearing in Tucson, Jun 1970, four alternative plans were presented: (1) N flood control project (2) a 12 mile earth-bottom channel with stone revetted banks (3) a 10 mil earth-bottom structural measures, a combinatio of zoning and water proofing (4) a 10 mile earth bottom channel with stone-revetted banks com bined with flood plain management. (Casey Arizona)
W71-07816

ASWAN DAM LOOSES A FLOOD O PROBLEMS,
Claire Sterling.
Life, Vol 70, No 5, p 46-46A, 12 Feb 1971.

Descriptors: *Dams, *River basins, *Salinization *Silts, *Arid lands, Political aspects, Social aspects Ecology, Hydroelectric power, Saline soils, So erosion, Fertility, Deltas.
Identifiers: *Egypt, *Aswan High Dam, *Nil River, *Developing nations.

For millenia, the Nile River has supported agricul ture in the Nile Valley by its annual flooding cycle The silts deposited by the floodwaters have main tained a high level of soil fertility and created th Nile Delta. Additionally, flood waters washed awa salt accumulations resulting from agricultural ac tivities. Since 1964, the Aswan High Dam ha eliminated annual flooding by backing up wate into Lake Nasser, and since 1967, it has bee producing hydroeletric power. The aim of the dam has been to permit double-crop agriculture by canal irrigation, flood elimination and powe production. Since the dam began operation, soi salinity levels have risen ominously, increasing amounts of acreage need artificial fertilzer and ero sion is eating at the Delta coastline, now exposed to the full force of marine currents. Bilharziasis, a de bilitating disease caused by a parasite carried by water snails, has shot from 0% to 80% in areas o newly-built canals. Control of the snails was for merly effected by the dry periods after the floods and the canals encourage the spread of snails. Because the fresher Nile waters no longer dilute Red Sea waters flowing into the eastern Mediterranean, marine ecologic upheaval has resulted, en-

ering the fishing industry of the entire area. ough the government hoped to reclaim),000 acres, so far less than 300,000 acres been reclaimed. Lake Nasser losses of water gh underground seepage and evaporation are nous. Because of the environmental damage it reated, the dam has greatly impoverished an ly destitute nation. (Casey-Arizona)
07821

ER RESOURCES DEVELOPMENT BY U.S. ARMY CORPS OF ENGINEERS IN JERSEY.
of Engineers, New York. North Atlantic Div.

Corps of Engineers Water Resources opment Report, Jan 1971. 72 p, 3 fig, 1 map, oto.

iptors: *Water resources development, *New , *Projects, *Surface waters, Navigation, control, Watershed management, Beach ero- Recreation, Water supply, Water quality, utilization, Evaluation, Planning.
fiers: *US Army Corps of Engineers.

eport provides information on the scope and ss of water resources development (naviga- lood control, basin development, beach ero- nd recreation) within the State of New Jer- the United States Army Corps of Engineers. ribes briefly the Corps' role in planning and g these improvements and includes an ex- ion of the procedure for initiating and sing them. Information is given on the status various projects, whether the work is eted, is underway, or has not been started. se the Civil Works' activities of the Corps of ers are organized by river basins rather than boundaries the work in this State comes the jurisdiction of more than one District. t locations and the District boundaries are on a map. (Woodard-USGS)
7921

R RESOURCES DEVELOPMENT BY U.S. ARMY CORPS OF ENGINEERS IN WARE.
of Engineers, New York. North Atlantic Div.

Corps of Engineers Water Resources pment Report, Jan 1971. 36 p, 4 fig, 1 map, to.

otors: *Water resources development, *Pro- *Surface waters, *Delaware, Navigation, control, Watershed management, Beach ero- Recreation, Evaluation, Planning, Water Water quality.

port provides information on the scope and s of water resources development (naviga- od control, basin development, beach ero- d recreation) within the State of Delaware United States Army Corps of Engineers. It es briefly the Corps' role in planning and g these improvements and includes an ex- on of the procedure for initiating and ing them. Information is given on the status various projects, whether the work is ted, is underway, or has not been started. e the Civil Works' activities of the Corps of ers are organized by river basins rather than oundaries the work in this State comes the jurisdiction of more than one District. location and the District boundaries are on a map. (Woodard-USGS)
7925

D PLAIN INFORMATION, BAYOU METO RIBUTARIES, JACKSONVILLE ARKAN-
f Engineers, Vicksburg, Miss.

Corps of Engineers Flood Plain Report, Aug 7 p, 25 fig, 27 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Arkansas, Flood plains, Regional flood, Flood forecasting, Flood control, Historic flood.
Identifiers: *Jacksonville (Ark), Standard Project Flood, Intermediate regional flood.

Flooding along Bayou Meto and its tributaries at Jacksonville, Arkansas and vicinity is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall runoff, historical flood heights and other technical data. The greatest flood known to have occurred in the vicinity of Jacksonville was in February 1969. However, the upper portion of the Bayou Meto Basin in the vicinity of the State Highway 5 Bridges across Bayou Meto and Kellogg Creek and above is subject to localized flash flooding and records show a lack of continuity with the more generalized flooding downstream. The maximum flood height recorded at the State Highway 5 Bridge across Bayou Meto was in May 1954 with an elevation of 253 ft above mean sea level. The maximum flood height at the State Highway 161 Bridge across Bayou Meto, 6.9 miles downstream, was in February 1969 with an elevation of 244 ft. On Bayou Two Prairie, 1969 high water marks were recorded at elevation 249 ft at the Section Line Road Bridge at Mile 45.5 and further upstream at the Missouri Pacific Railroad Bridge over Jack Bayou high water marks indicate a flood crest elevation of 251 ft. (Woodard-USGS)
W71-07933

FLOOD PLAIN INFORMATION, MIDDLE FORK FORKED DEEP RIVER AND TRIBUTARIES, VICINITY OF HUMBOLDT, TENNESSEE.
Corps of Engineers, Memphis, Tenn.

Army Corps of Engineers Flood Plain Report, Feb 1970. 45 p, 11 fig, 15 plate, 6 tab.

Descriptors: *Floods, *Flood damage, *Tennessee, Flood plains, Regional flood, Flood forecasting, Flood control, Historic flood.
Identifiers: *Humboldt (Tenn) area, Standard Project Flood, Intermediate regional flood.

Flooding in the Humboldt, Tennessee area along the Middle Fork Forked Deep River and its tributaries is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extend of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Durations of floods are relatively short on the streams in the vicinity of Humboldt. During the flood of January 1956 the middle Fork Forked Deer River rose to its crest stage in about two days at a maximum rate of rise of about 0.4 foot per hour and remained out of its banks for nine days. The overall ranges in stage on the tributary streams are less than those for the Middle Fork Forked Deer River, and these streams rise to their peak in only a few hours. (Woodard-USGS)
W71-07934

LONG-RANGE FORECASTS OF RUNOFF FROM MOUNTAIN RIVERS OF SIBERIA (RUSSIAN: DOLGOSROCHNYYE PROGNOZY STOKA GORNYKH REK SIBIRI),
A. A. Kharshan.
Gidrometeorologicheskiy Nauchno-Issledovatel'skiy Tsentr SSSR Trudy, No 65; Leningrad, 1970. 210 p, 57 fig, 34 tab, 240 ref.

Descriptors: *Runoff forecasting, *Hydrologic data, *Water resources, *Runoff, *River forecasting, Base flow, Rainfall-runoff relationships, Discharge (Water), Snowmelt, Topography, Geomorphology, Hydroelectric plants, Reservoir storage, Seasonal, Inflow, Meteorological data, Hydrogeology, Hydrography, Precipitation (Atmospheric), River basins, Snow surveys.
Identifiers: *Siberia, *Mountain rivers, Meteorological satellites.

Methods for long-range forecasting of runoff from Siberian mountain rivers are based on a study of runoff in the Irtysh, Ob', Yenisey and Angara River basins. Principal aspects of runoff considered are volume of spring-summer high water, average monthly and maximum discharges of water in spring and summer, monthly and quarterly runoff during summer-fall and winter seasons. For rivers of the Altay, Western Sayan and western slope of Eastern Sayan, snowmelt is 65-70% of high water runoff and 45-50% of annual runoff, while rainfall runoff is 20-25% and 40-45%, respectively. For waters of the eastern slope of Eastern Sayan and the Lake Baykal basin, snowmelt is 50-60% of high water runoff and 25-30% of annual runoff, while rainfall runoff is 30-40% and 60-65%, respectively. Glacier runoff only plays an important role at the upper reaches of high-mountain rivers of the Altay. Steady groundwater flow for all rivers is 10-15% of annual runoff. Generally, the ratio between snowmelt and rainfall runoff becomes less favorable for forecasting spring and summer-fall flow as one proceeds eastward. For the first time methods were worked out for long-range forecasting of water inflow to reservoirs of large hydroelectric power stations in Siberia, although formulation of runoff forecast methods for Siberian mountain rivers is complicated by lack of observations of snow cover, precipitation and other meteorological factors in mountains. (Josefson-USGS)
W71-07946

HYDROLOGICAL FORECASTS AND MODERN COMPUTERS,
Gidromteorologicheskii Nauchno-Inssledovatelsii Tsentr, Moscow (USSR).
L. S. Kuchment, and Ye. P. Chemerenko.
Trans from Zemlya i Vselennaya, No 3. Foreign Technology Div., Wright Patterson AFB, Machine Transl FTD-MT-24-193-70. Available from National Technical Information Service as AD-716 942, $3.00, paper copy, $0.95 microfiche.

Descriptors: *Hydrology, *Forecasting, *Surface waters, *Mathematical models, *Computers, Meteorology, Data collections, Streamflow, Precipitation (Atmospheric), Hydrographs, Weather forecasting, Flood forecasting, Runoff forecasting.

Every year the Hydrometeorological Center USSR issues more than 100,000 hydrological forecasts and warnings. This center is in charge of scientific and methodological work in this field, makes forecasts and issues a hydrological bulletin containing information on the general status of rivers, lakes and reservoirs in different regions of the USSR. In the regional administrations of the Hydrometeorological Service there are forecasting bureaus which prepare and disseminate hydrological forecasts. Any further development of hydrological forecasts or improvement in the advance time of forecasts is dependent on the mathematical description of hydrological processes and the relationships between individual hydrometeorological elements. Until recently forecasts have been based on simple physical or statistical relationships, which are entirely inadequate considering the complexity of the elements involved. Soviet scientists have developed a physical theory of the development of hydrological processes which can serve as a good basis for constructing reliable mathematical models. (Woodard-USGS)
W71-07948

COMPUTER SIMULATION OF CLINCH MOUNTAIN DRAINAGE NETWORKS,
IBM Thomas Watson Research Center, Yorktown Heights, N.Y.
J. S. Smart, and V. L. Moruzzi.
Available from National Technical Information Service, as AD-717 086, $3.00 in paper copy, $0.95 in microfiche. IBM Thomas J. Watson

Research Center Technical Report No 1, July 1970. 29 p, 10 fig, 5 tab, 12 ref. Contract No N00014-70-C-0188 ONR, Task No NR 389-155.

Descriptors: *Drainage patterns (Geologic), *Natural streams, *Computer models, *Mountains, *Virginia, Tennessee, Topography, Hydrology, Geology, Lithification, Data collections, Runoff, Computer programs.
Identifiers: *Drainage networks, Clinch Mountain (Va and Tenn).

Clinch Mountain, in southwestern Virginia and northeastern Tennessee, is a long homoclinal ridge with a dip angle that varies along the strike. The base width and height both decrease with increasing dip, so that the mountain provides an excellent example of a system with uniform lithology and structure but varying structural parameters. Various properties of the stream networks on both the dip and scarp slopes were measured and analyzed as a function of dip angle. A random-walk headward-growth model of stream network development was used to simulate the Clinch Mountain network; the criterion for a successful simulation was that the simulated and actual networks should have statistical geometrical similarity. Satisfactory results were obtained if both the reduced width (product of width and drainage density), and the number of outlets per unit length were assigned as input parameters. (Woodard-USGS)
W71-07952

INSTITUTIONAL DESIGN FOR WATER QUALITY MANAGEMENT: A CASE STUDY OF THE WISCONSIN RIVER, VOL I, SECTION A - SUMMARY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05G.
W71-07972

THE 1963-64 LAKE MEAD SURVEY,
Bureau of Reclamation, Denver, Colo. Office of Chief Engineer.
J. M. Lara, and J. I. Sanders.
Available from the National Technical Information Service as PB-197 510, $3.00 in paper copy, $0.95 in microfiche. Report REC-OCE-70-21, Aug 1970. 162 p, 52 fig, 16 tab.

Descriptors: *Reservoir surveys, *Reservoir silting, Aggradation, Core drilling, *Geodetic surveys, First order surveys, Land subsidence, *Gamma rays, Rebound, *Hydrographic surveys, Sounding, Photogrammetry, Thalweg, Topographic mapping, *Sedimentation, Fluvial hydraulics, Unit weight, Sediment transport, Sediment sampling, *Physical properties, Watersheds, Basins, Trap efficiency.
Identifiers: Reservoir capacity, Gamma probes, Arizona-Nevada, *Lake Mead.

The 1963-64 Lake Mead survey was run to compute the reservoir capacity. Results of the geodetic and hydrographic surveys and sediment sampling equipment are described. The geodetic survey showed Hoover Dam subsided an average of 118 mm since 1935. Sonic sounding, photogrammetry, and cross-sectional profiling methods were used to run the hydrographic survey. Reservoir area and capacity tables were generated using an electronic computer. The present lake capacity is 29,755,000 acre-ft and the reservoir surface area is 162,700 acres at elevation 1229 ft. 2,720,000 acre-ft of sediments accumulated in the lake since 1935. A unit weight of 60 lb/cu ft was determined representative of the deposited sediments. Samples were collected from the major basins with a piston core sampler. A gamma probe was used to measure in situ wet bulk densities. Special sampling with a drill rig was conducted in Pierce Basin representing the sediment accumulation in the delta area. The reservoir trap efficiency is judged to be 100%.
W71-08051

A BASIC HYDROLOGIC FORECAST OF THE DISTRIBUTION OF RUNOFF FROM MOUNTAIN RIVERS DURING A GROWING SEASON (RUSSIAN: FONOVYY PROGNOZ RASPREDELENIYA STOKA GORNYKH REK V VEGETATSIONNYY PERIOD),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02E.
W71-08100

EFFECT OF FLAT BOG DRAINAGE ON THE RUNOFF REGIME OF SPRING HIGH WATER AND SUMMER FLOODS (RUSSIAN: VLIYANIYE OSUSHENIYA NIZINNYKH BOLOT NA REZHIM STOKA VESENNEGO POLOVOD'YA I LETNIKH PAVODKOV),
Ministry of Land Reclamation and Water Economics, Minsk (USSR).
V. F. Shebeko.
Meteorologiya i Gidrologiya, No 12, p 52-58, Dec 1970. 7 p.

Descriptors: *Drainage effects, *Bogs, *Surface runoff, *Soils, Land reclamation, Wetlands, Base flow, Floods, Hydrogeology, Geomorphology, Saturated soils, Watersheds (Basins), Gaging stations, Soil physical properties, Storage capacity.
Identifiers: *Belorussia, Rain floods, Maximum discharge.

The effect of flat bog drainage and reclamation on the maximum runoff of spring high water is examined from long-term data of 10 gaging stations on reclaimed and undrained bogs of the Belorussian SSR. The Wetlands cover a bog area of more than 300 square kilometers and have similar soil, hydrogeological and geomorphological characteristics. Analyses of the soils physical properties, hydrogeology and geomorphology show that runoff conditions prior to basin drainage are homogeneous for the entire bog area. Studies of spring high-water maxima indicate that spring high-water formation conditions for drained and reclaimed bogs are subject to maximum variability, with the storage capacity of peat soils, soil freezing, surface runoff and melt water infiltration conditions varying more than on undrained bogs. Long-term observations reveal that there is essentially no surface runoff from reclaimed bogs during the summer and fall. The influence of bog drainage and reclamation on maximum flood runoff is evidenced from a decrease in maximum discharge of flood water as the size of drained bog areas increases. Generally, bog drainage and reclamation have little effect on rain flood maxima. (Josefson-USGS)
W71-08103

THE WATER BALANCE AND ITS TRANSFORMATION IN THE USSR (RUSSIAN: VODNYY BALANS SSSR I YEGO PREOBRAZOVANIYE).

Moscow, 'Nauka' Publishing House, 1969. 337 p, 69 fig, 140 tab, 429 ref.

Descriptors: *Water balance, *Water resources, *Hydrologic cycle, *Meteorological data, *Streamflow forecasting, Water conservation, Water utilization, Evaporation, Water supply, Water storage, Runoff, Forecasting, Soils, Rivers, Agronomic crops, Base flow, Precipitation (Atmospheric), Soil management, River basins.
Identifiers: *USSR, Agricultural practices, Zonal patterns, Regionalization, Soil zones, Mountain regions.

A forecast method is given for examining the effects of agriculture and forest management on water balance and streamflow in the USSR, with estimates of management influence projected to the year 1980. Studies were conducted in districts near Moscow, in the southern Transvolga and, during the last few years, in the Kursk Oblast. To study the natural water balance, a new geographic method takes into account the rock and soil elements of the water cycle and establishes relationships between groundwater flow, surface runoff, and soil moisture content. The first section of the three-part monograph is devoted to a study of zon patterns of water balance and and to the use of th geographic method for studying water balance mountain regions. Results of investigations of wat balance transformations are discussed in terms the influence of various agricultural practices in t Ukraine, Kazakhstan and Western Siberia. T concluding section examines problems of wat balance control and the principles underlying r tional use and conservation of the water resourc of the USSR. (Josefson-USGS)
W71-08104

THE CROSS-FLORIDA BARGE CANAL: A LE SON IN ECOLOGY,
For primary bibliographic entry see Field 06G.
W71-08105

THE LAYOUT OF NEW NAVIGABLE WATE WAYS,
Administration des Ponts et Chausees, Pa (France).
For primary bibliographic entry see Field 08A.
W71-08120

A STORM DRAINAGE AND OPEN SPA MASTER PLAN FOR HAMILTON COUNT OHIO.
Consoer, Townsend and Associates, Chicago, Ill.

Hamilton County Regional Planning Commissi Cincinnati, Ohio, Dec 1966. 77 p, 15 fig. HU Urban Planning Project -- Ohio P-53.

Descriptors: *Flood control, *Drainage progra *Flood protection, *Cost-benefit analy *Planning, Flood plain zoning, Floodproofi Land use, Administration, Drainage practic Storm runoff, Urbanization, Financing, Eros control, Sedimentation, Ohio.
Identifiers: *Open space, Flood hazards, Flo prevention, Master plan.

A long-term strategy and conceptual plan w developed for providing storm drainage and op space in Hamilton County, Ohio. A complete ventory was made of all streams, culverts a bridges having tributary drainage areas grea than 300 acres. These are shown on maps i separate appendix. The study develops a meth for determining flood flows for the structures a streams, establishes the design flows, and prese findings of the adequacy of all structures a streams with suggestions for improvement there Information is given on present and future flo hazards, erosion and siltation problems, and op space land needs. Also included are suggestions subdivision regulations, legislative guidelines, a suggestions for financing and administering the provement programs that are adopted. The st covers the main watercourses and their branche the seven major drainage basins of Hamilton Co ty and portions of the watersheds within the City Cincinnati that drain into County streams. major outlet channels within other incorpora areas in the County are also included. Recomm dations are made for improving 49 public str tures and 22.1 miles of streams. Estimated costs summarized, by drainage basin, in a separate pendix. A section is included on benefit-cost re tions in connection with expenditures of pu funds for drainage and flood control. (Poertner) W71-08122

DRAINAGE AND FLOOD CONTR BACKGROUND AND POLICY STUDY, SU MARY REPORT.
Nolte (George S.) and Associates, San Francis Calif.

Available from the National Technical Informat Service as PB-196 840, $3.00 in paper copy, $0 in microfiche. San Diego County Comprehen Planning Organization, California, May 1970. 2 5 fig. HUD Project No Calif P-294 (G).

criptors: *Flood control, *Drainage practices, annel improvement, *Flood forecasting, mputer programs, Land use, Drainage pro-ns, Flood protection, Construction costs, inage engineering, Drainage systems, Storm ru-, Administration, Flood plain zoning, Califor- Planning, Synthetic hydrology, Urbanization.
tifiers: *San Diego County (Calif), Regional d control organization, Channel improvement s.

ood potential exists in many areas of San Diego nty and additional flood hazards are an-pated because of continuing population in-ses. This summary report contains highlights of findings and conclusions presented in Volumes d II. The study identifies the drainage and flood trol problems of the San Diego region and pro-s an up-to-date inventory of pertinent drainage flood control information. The drainage and d control information prepared in this study be used as a basis for developing a regionwide and program. Volume I presents physical criptions for eight major drainage basins; lyzes urban growth factors as a part of the nage and flood control problem; and suggests n possible alternative organizational arrange-ts for carrying out flood control work for the on. Volume II describes URB DRA CONS, a puterized method for the systematic evaluation rbanization's effects on design and costs of d control facilities. It was developed for uating the effects of alternative land uses. ailed information on the methodology, includ-its pilot application to the Los Coches Creek rshed, are described in Volume II. Instruc-s for use and documentation of the computer grams are provided. (See also W71-08126 and -08127) (Poertner)
-08125

AINAGE AND FLOOD CONTROL CKGROUND AND POLICY STUDY, LUME 1,
te (George S.) and Associates, San Francisco, f.

ilable from the National Technical Information vice as PB-196 838, $3.00 in paper copy, $0.95 nicrofiche. San Diego County Comprehensive nning Organization, California, May 1970. 276 5 fig, 18 tab, 216 ref. HUD Project No Calif P-(G).

criptors: *Drainage programs, *Flood control, dministration, *Land use, *Drainage practices, od protection, Flood plain zoning, Watersheds sins), California, Drainage systems, Hydrology, inage engineering, Drainage effects, Storm ns, Storm runoff, Urbanization, Financing, nning.
ntifiers: San Diego County, Regional flood con-organization.

praisals of drainage and flooding problems in Diego County are presented. Current practices providing drainage and flood prevention facili-and programs are described for each of the 108 l, state and federal agencies having such hority or responsibility in the San Diego region. an developments in the flood plains have sed the serious flood hazards that now exist. ulation increases will amplify flood problems ss effective control of land-use is implemented. re is sufficient usable land in the region for pro-ed urban needs without further encroachment flood plains. The responsibility for rivers and ams, land use control in flood plains, and the elopment of protective facilities and programs ragmented among many agencies. Seven alter-ve governmental organizational units are sug-ed for developing a coordinated regional ap-ach needed to achieve effective solutions to d problems. Detailed descriptions are included he hydrology and other characteristics of the t drainage basins in San Diego County. Also ussed are urban growth patterns, land uses in d plains, implementation of flood control and inage programs and financing methods. The responsibilities and authority of each public agency identified with storm drainage and flood control are outlined. An extensive annotated bibliography of publications pertinent to flood control and drainage in San Diego County is included. (See also W71-08125) (Poertner)
W71-08126

DRAINAGE AND FLOOD CONTROL BACKGROUND AND POLICY STUDY, VOLUME II, A COMPUTER METHODOLOGY FOR DETERMINING URBANIZATION'S DRAINAGE CONSEQUENCE.
Nolte (George S.) and Associates, San Francisco, Calif.

Available from the National Technical Information Service as PB-196 839, $3.00 in paper copy, $0.95 in microfiche. San Diego County Comprehensive Planning Organization, California, May 1970. 95 p, 6 fig, 7 tab, 3 ref. HUD Project No Calif P-294 (G).

Descriptors: *Flood control, *Land use, *Computer programs, *Channel improvement, *Flood forecasting, Urbanization, River forecasting, Construction costs, Hydraulic models, Hydrograph analysis, Stage-discharge relations, Streamflow forecasting, Surface runoff, Synthetic hydrology, Simulation analysis, Drainage engineering, Planning, California.
Identifiers: *San Diego County (Calif), Channel improvement costs.

The computer program URB DRA CONS (Urbanization's Drainage Consequence) developed in this study provides a methodology to test both long and short-range consequences of varying forms of urbanization within flood plains and areas contiguous to flood plains. With this tool, planners and engineers can investigate a variety of land-use patterns to determine their downstream consequences in terms of the estimated cost of channel improvement for varying degrees of flood protection. URB DRA CONS has been tested, and it is now operational on the computer at San Diego County's Operation Center. The concepts involved in the development of the URB DRA CONS computer methodology are explained herein. Application of the methodology involves use of the County's IBM 1130 computer. The URB DRA CONS programs for use on this computer are listed in the appendixes of this report. The application of URB DRA CONS to the Los Coches Creek watershed is presented to serve as a specific example of the methodology. Finally, there is a discussion of program modifications, research gaps, and missing data which must be accounted for before the URB DRA CONS methodology can be directly applied to the complete development of a county-wide flood control master plan. (See also W71-08125) (Poertner)
W71-08127

PASTURE IMPROVEMENT THROUGH EFFECTIVE WEED CONTROL,
Agricultural Research Service, Lincoln, Nebr.
M. K. McCarty, and C. J. Scifres.
University of Nebraska, College of Agriculture and Home Economics, Quarterly, Vol 14, No 4, p 23-26, Winter 1968. 5 tab, 4 fig.

Descriptors: *Cutting management, *Weed control, *Reclamation, *Pasture management, *Herbicides, Weedicides, Nebraska, Pastures, Weeds, Grasses, Legumes, Ranges, 2-4-D, Fertilization, Forages.

Overuse and mismanagement caused degeneration of many acres of pasture and rangeland in Nebraska. Undesirable weeds replace the desirable grasses and legumes which are weakened by overuse. Mowing, herbicides and reseeding are evaluated as weed control tools for pasture management. Mowing is relatively ineffective. Good control is obtained on broadleaf weeds by 2,4-D ester, though some undesirable grasses such as prairie threeawn are difficult to control. Combination herbicides such as 2,4-D, picloram or dicamba with amitrole may control mixed broadleaf-prairie threeawn infestations. Fertilized grasses produce vigorous growth which resists weed infestation. Re-seeding is an effective restoration to forage; plowing the pasture and growing a row crop for one or more years will kill most weeds. Selection of proper herbicide and reseeding specie is important for effective weed control. Tables show results of 9-, 8-, 6-, 3and 2- year studies. Figures show effects of 2,4-D and picloram, structure of 2,4-D, picloram and dicamba, and a photograph of amitrole and picloram effectiveness. (Popkin-Arizona)
W71-08153

FLOOD PROTECTION AT CULVERT OUTLETS,
Colorado State Univ., Fort Collins.
D. B. Simmons, M. A. Stevens, and F. J. Watts.
Available from the National Technical Information Service as PB-196 972, $3.00 in paper copy, $0.95 in microfiche. Wyoming State Highway Dept, Planning and Research Division Report, 1970. 213 p.

Descriptors: *Flood routing, *Flood control, Flow, Flood protection, *Bridges, *Culverts, Riprap, Spillways, Outlet works, Drains, Abutments, Colorado, Testing.

Techniques for the design of stable rock-riprap protection in the vicinity of bridge crossings are computed from methods derived in other sources, and the properties are related to particle sizes for riprap protection of abutments and piers. Design steps for prototype bridge crossings are enumerated so that the hydraulic engineer may use this report as a design manual. An example of the design protection for a prototype bridge crossing is included to clarify the suggested design procedures. Riprap-protected spill-through abutments were constructed in the hydraulic facilities at Colorado State University in order to test the validity of the suggested design procedures. The results of this research will become the standard for establishing erosion protection required at bridges.
W71-08182

THE USE OF SYSTEMS ANALYSIS IN THE DEVELOPMENT OF WATER RESOURCES MANAGEMENT PLANS FOR NEW YORK STATE,
New York State Department of Environmental Conservation, Albany. Div. of Water Resources.
For primary bibliographic entry see Field 08A.
W71-08185

APPENDIXES TO THE USE OF SYSTEMS ANALYSIS IN THE DEVELOPMENT OF WATER RESOURCES MANAGEMENT PLANS FOR NEW YORK STATE,
New York State Department of Environmental Conservation, Albany. Div. of Water Resources.
For primary bibliographic entry see Field 06A.
W71-08186

FLOOD CONTROL RELEASE OPTIMIZATION USING METHODS FROM CALCULUS,
Colorado Univ., Denver.
William C. Hughes.
Journal of the Hydraulics Division, ASCE, Vol 97, No HY 5, p 691-704, May 1971. 14 p, 4 fig, 5 ref, 2 append.

Descriptors: *Optimization, *Mathematical modeling, *Flood control, *Reservoir operation, *Networks, *Costs, Flow, Storage, Flood routing, Time, Damages.
Identifiers: Calculus.

A means for modeling the operation of a flood control reservoir as a minimization problem which yielded an optimum release schedule for a reservoir or network of reservoirs was presented. The

problem was formulated to use methods from calculus as a means for obtaining a minimum solution and could be altered to make use of mathematical programming techniques. The analysis was limited to the operation of a network of flood control reservoirs and assumed that decisions regarding size, location, scale of development, etc. were made. The solution involved discrete time increments and used Lagrange multipliers to minimize a loss or cost function which included both the future flood risk costs resulting from storage and direct downstream damage costs associated with the magnitude of reservoir releases. The cost function was developed along with two flow functions, derived from a reservoir routing equation and a channel routing equation, and storage for a single flood control reservoir, a network of flood control reservoirs in parallel, and a network of flood control reservoirs in series. A general solution of the problem was demonstrated both mathematically and graphically for the case of a single reservoir. With more than one reservoir in the network minimization became increasingly difficult and solution of a system of polynomials was required to obtain the minimum cost release schedule. (Kriss-Cornell)
W71-08192

SOME EFFICIENT DYNAMIC PROGRAMMING ALGORITHMS FOR THE OPTIMAL SEQUENCING AND SCHEDULING OF WATER SUPPLY PROJECTS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 06A
W71-08193

OPERATING RULES FOR JOINT OPERATION OF RAW WATER SOURCES,
Wisconsin Univ., Madison. Dept. of Civil Engineering; and Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
Erhard F. Joeres, Jon C. Liebman, and Charles S. ReVelle.
Water Resources Research, Vol 7, No 2, p 225-235, Apr 1971. 11 p, 5 fig, 1 tab, 10 ref.

Descriptors: *Linear programming, *Simulation analysis, *Streamflow, *Water supply, *Optimization, *Costs, *Operations, Reservoirs, Water demand.
Identifiers: Susquehanna River, Synthetic streamflow generation.

The techniques of linear programming, synthetic streamflow generation, and simulation were merged to derive operating rules for a multiple source water supply. The general approach was demonstrated for the Baltimore water supply; where upland reservoirs furnish water by gravity flow, and a backup supply delivers pumped water from the Susquehanna River. The objective was to find the optimal (least cost) set of release decisions for the reservoirs such that (1) demands were met a given percentage of the time; (2) shortages would not exceed a stated magnitude more than a given percentage of the time; (3) reservoir releases were within the capacities of either the withdrawal structure or the treatment plants; and (4) quantities of water pumped through the Susquehanna pipeline were within the capacity of the pipeline or treatment plant. Chance constrained linear programming was employed to select candidate operating policies under the given power rate schedule, which were subsequently tested by a simulation program for long-term performance. The linear programming (LP) problem was solved for four different demand levels for four different weighting factors for summer pumping and simulation runs were carried out. Results indicated that the overall system average monthly operating cost could be reduced by using the derived operating results while at the same time maintaining system performance levels. (Kriss-Cornell)
W71-08195

OPTIMUM DESIGN OF INTERBASIN TUNNEL SYSTEMS,
Florida Univ., Gainesville. Dept. of Civil Engineering.
B. A. Christensen, and Peter W. Bush.
Water Resources Bulletin, Vol 7, No 2, p 273-284, Apr 1971. 10 p, 3 fig, 2 ref.

Descriptors: *Optimization, *Computer programs, *Reservoir operation, *Tunnel design, *Inter-basin transfers, *Costs, *Discharge (Water), Decision making, Constraints, Energy losses.
Identifiers: Objective function.

A system involving an arbitrary number of subreservoirs discharging water by tunnel systems into a main reservoir was considered. All tunnels were flowing full and it was assumed that all elevations of water surfaces in the subreservoirs and discharges leaving these were known. An iterative differential-calculus method was developed for the determination of all tunnel sizes giving minimum total cost of the system using the total cost function as the objective function. The energy losses in the tunnels rather than individual tunnel diameters were chosen as decision variables and resulted in substantial simplification of the set of equations representing the constraints. In order to establish the objective function in terms of energy losses, discharges and expressions relating to energy loss to tunnel size was known in all tunnels. Influence of average construction cost per unit volume, tunnel roughness and cross-sectional shape was taken into consideration. The corresponding computer program for the general case was presented but the method may also be applied to pipe systems, open channel systems, or combined systems by introduction of proper cost functions for these conduits. (Kriss-Cornell)
W71-08198

OPERATION OF RESERVOIR IN INTEREST OF FLOOD CONTROL.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-08240

A STOCHASTIC APPROACH TO THE DEVELOPMENT OF A REGULATION PLAN FOR THE GREAT LAKES,
Department of Energy, Mines and Resources, Ottawa (Ontario); and McGill Univ., Montrel (Quebec).
For primary bibliographic entry see Field 06B.
W71-08267

APPLICATIONS OF MONTE-CARLO METHOD TO RESERVOIR DESIGN,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
For primary bibliographic entry see Field 06A.
W71-08268

REGIONAL AND RIVER BASIN WATER SUPPLY SYSTEMS.
Corps of Engineers, Washington, D.C.; Bureau of Reclamation, Washington, D.C.; and Soil Conservation Service, Washington, D.C.

In: Public Facility Needs, Washington, DC, 1966, p 95-104.

Descriptors: *Water supply, *River basin, *Reservoirs, *Dams, *Water resources development, Water storage, Flood control, Hydropower, Navigation, Irrigation, Recreation, Fisheries, Costs, Capital.
Identifiers: *Water Resources Planning Act, *Public facility, *Public works, User charges.

The current storage situation is described for municipal and industrial water supply purposes in reservoirs constructed by the Departments of the Army, Interior and Agriculture. Each facility described results from dams constructed for multi-

ple-purpose control of the waters involved, enco
passing flood control, hydro-electric pow
navigational flow regulation, pollution control,
rigation, recreation, fisheries, and local wa
supply purposes. The article surveys the stor
facilities built by the Army Engineers, the Rec
mation Bureau and the Soil Conservation Servi
Each of these is analyzed according to the nat
and composition of the public work or facility,
costs and user charges, the trend of capital outla
and the needs and prospective capital outlays.
response to the requirements of the Wa
Resources Planning Act of 1965, the arti
presents the water storage situation in a man
designed to suggest prudent plans for the futu
facilitating economically feasible water resou
development. (See also W71-08281) (Murp
Rutgers)
W71-08287

HUMAN RESPONSE TO FLOODS,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 06B.
W71-08292

4B. Groundwater Management

**DILUTION OF AN INDUSTRIAL WASTE I
FLUENT WITH RIVER WATER IN T
VADOSE REGION DURING PIT RECHARGE**
Arizona Water Resources Research Center, T
son.
For primary bibliographic entry see Field 05D.
W71-07817

**THE ECONOMICS OF CROPPING SYSTE
FOR WESTERN COLORADO,**
Economic Research Service, Washington, D
Farm Production Economics Div.
For primary bibliographic entry see Field 03F.
W71-07830

**OPTIMAL USE OF COUPLED LEA
AQUIFERS,**
New Mexico Inst. of Mining and Technolo
Socorro.
Z. A. Saleem, and C. E. Jacob.
Water Resources Research, Vol 7, No 2, p 3
393, Apr 1971. 12 p, 5 fig, 4 tab, 27 ref OW
Project A-028-NMEX (1).

Descriptors: *Conjunctive use, *Aquifers, *O
timization, *Water utilization, *Dynamic p
gramming, Mathematical models, Systems analy
Irrigation water, Confined water, Artesian wa
New Mexico, Aquitards, Probability, Cost-ben
analysis, Consumptive use, Phreatophy
Evapotranspiration.
Identifiers: *Roswell (N Mex).

Aquifers enclosed or confined by sediments t
impede or retard the vertical movement of grou
water generally leak. A stochastic dynamic p
graming model for the optimal operation of a co
posite system of two coupled leaky aquifers an
surface water subsystem is formulated and appl
to the Roswell basin in New Mexico. The opti
operating policies for the two coupled aquifers
the basin are influenced by the values added to
basin by different crops, by the amounts of wate
storage in the two aquifers, by the discount fac
and by mutual leakage of the aquifers. Some
these factors tend to increase whereas others t
to decrease the operating policy. The resultan
all these factors determines the final operat
decision rule. The magnitude and direction
leakage are determined by the relative storage
the aquifers. Coupled aquifer systems should
treated as single sources and considered only
conjunctive use. (Knapp-USGS)
W71-07916

OLOGY AND GROUNDWATER OURCES OF ELLSWORTH COUNTY, CEN-L KANSAS,
as State Geological Survey, Lawrence.
primary bibliographic entry see Field 02F.
-07920

LLING TEST HOLES FOR IRRIGATION LS.

nd Water Age, Vol 5, No 8, p 34-35, Apr . 2 p, 3 photo.

riptors: *Irrigation wells, *Drill holes, ling, *Drilling equipment, *Rotary drilling, ration, On-site investigations, Methodology, gic formations, Groundwater.
ifiers: *Test holes.

racy of test holes can be affected by type of geologic conditions or drilling technique of tor. Six things may be found from the drilling (1) possibilities for a successful well; (2) best ion for the well; (3) depth from which a ed amount of water can be pumped most omically; (4) approximate yield and pumping that can be expected from the completed well; best place for screen in well and best length, eter, type and slot opening size; (6) most able type gravel pack. Drilling techniques in us types of geologic formations are described. dard-USGS)
-07922

UNDWATER FOR IRRIGATION NEAR E EMILY, POPE COUNTY, WEST-CEN-L MINNESOTA,
gical Survey, Washington, D.C.
e A. Van Voast.
ale by the Superintendent of Documents, US rnment Printing Office, Washington, DC, 2, Price 25 cents. Geological Survey Water - y Paper 1899 - J, 1971. 28 p, 14 fig, 3 tab, 13

riptors: *Irrigation water, *Minnesota, undwater, *Water resources development, cial drift, Aquifers, Hydrogeology, Water Transmissivity, Permeability, Water quality.
ifiers: *Pope County (Minn).

Lake Emily area, Minnesota, thickness of the l drift ranges from about 200 feet to more 400 feet. Within the drift are sand and gravel ers, some of which can yield adequate water ies for irrigation. Outwash, as much as 60 feet liexx at the surface. Where the outwash has ated thicknesses of more than 40 feet and missivities of more than 50,000 gallons per er food locally in the northern and western of the area, the aquifer should yield more 600 gallons per minute to wells. Water in the d and surficial aquifers is mainly of a calcium esium bicarbonate type and is suitable for ir-on. Calculated and estimated sodium adsorp-ratios and salinity and boron concentrations thin the limits recommended by the U. S. De-ent of Agriculture. (Knapp-USGS)
07923

NE GROUND-WATERS IN THE CAR-FEROUS ROCKS OF THE ENGLISH EAST ANDS IN RELATION TO THE GEOLOGY,
r Resources Board, Reading (England); and h Petroleum Co., Ltd., London (England).
rimary bibliographic entry see Field 02F.
07965

ER FROM THE DESERT'S BED,
lwards.
try Life, Vol 149, No 3849, p 612-614, Mar 971. 5 fig.

iptors. *Irrigation systems, *Water sources, urface waters, *Water supply, Arid lands.
fiers: *Qanats, *Iran.

Ancient and modern dependence for irrigation and water supply of Iran's desert agriculture upon qanats, or underground water tunnels is reviewed. Some qanats are as long as 25 miles and carry water from wells which are 250 feet deep. Qanats are observable from afar as mounds of soil around ventilation shafts dug at intervals of 50 yards along the tunnels. The qanats also support a species of transparent, blind fish whose disappearance from a qanat is supposed to presage its drying up. 1961 statistics show approximately 20,000 qanats in use and supplying nearly one-third of the water needed for irrigation in Iran. Modern water demands for supporting Iran's cultivated lands, two-fifths of which is irrigated, will require supplementation from the reservoirs of large multipurpose dams. Terheran which once obtained all its water from qanats, now takes over one half from the Amir Kabir reservoir. (Cowgill-OWRR)
W71-08052

A STUDY ON CHANGES IN QUALITY OF UNDERGROUND WATER,
Tabela House, Kota (India). Agricultural Chemistry Section.
For primary bibliographic entry see Field 05B.
W71-08073

RELATION OF FRACTURE TRACES, JOINTS, AND GROUNDWATER OCCURRENCE IN THE AREA OF THE BRYANTSVILLE QUADRANGLE, CENTRAL KENTUCKY,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W71-08077

GEOLOGY AND GROUNDWATER CONDITIONS OF THE ALLUVIAL TRACT, EAST OF DURGAPUR, BURDWAN DISTRICT, WEST BENGAL - A PRELIMINARY STUDY,
Geological Survey of India, Calcutta.
For primary bibliographic entry see Field 02F.
W71-08098

DUNES ON THE PLAINS - THE SAND HILLS REGION OF NEBRASKA,
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 02F.
W71-08112

A PRELIMINARY 'LEAST COST' STUDY OF FUTURE GROUNDWATER DEVELOPMENT IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana, Ill.
A. F. Moench, and A. P. Visocky.
State of Illinois Department of Registration and Education, Springfield, Circular 102, 1971. 19 p, 4 fig, 3 tab, 10 ref.

Descriptors: *Water management (Applied), *Water supply, *Water costs, *Cost analysis, *Aquifers, Water sources, Water demand, Pumping, Water purification, Water treatment, Municipal water, Water requirements, Costs, Illinois, Lake Michigan, Simulation analysis.
Identifiers: *Northeastern Illinois, *Groundwater costs.

An estimate was made of the average cost of producing groundwater in northeastern Illinois and to treat it to make it comparable in quality with treated Lake Michigan water. A digital simulation model was used. The cost of raw and treated groundwater produced in quantities sufficient, in most cases, to meet the projected demand to 2020 was estimated for each township in the six-county area. Three sources of groundwater were considered: the shallow sand and gravel aquifers, the shallow dolomite aquifers, and the deep sandstone aquifers. Unit costs of wells, pumps, and rehabilitation were obtained for each aquifer in each township. These included both amortized capital costs and operation-maintenance-repair costs (in 1970 dollars). The costs of storage and distribution to consumers were not considered. Results showed that raw water varied in cost from as little as 2 cents per 1000 gallons to as much as 14 cents per 1000 gallons depending upon the depth to the deep sandstone water. The unit cost of treated water varied from 22 to 53 cents per 1000 gallons, the lower costs applying to the largest users because of the economy of scale in treatment. Also because of this economy of scale, the cost of treated water tended to decrease with time; the cost of raw water increased with time. Fourteen townships were found to be deficient in groundwater in 2020, by a total of 147 million gallons per day, and will have to find alternative sources. (Poertner)
W71-08123

RECLAMATION OF WASTE WATER FOR WELL INJECTION,
Los Angeles County Flood Control District, Calif.; and California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 05D.
W71-08124

COST OF DOMESTIC WELLS AND WATER TREATMENT IN ILLINOIS,
Illinois State Water Survey, Urbana.
James P. Gibbs.
Illinois Department of Registration and Education, Springfield, Circular 104, 1971. 23 p, 11 fig, 4 ref.

Descriptors: *Water costs, *Costs analysis, *Water supply, *Water management (Applied), *Water wells, Wells, Domestic water, Water purification, Pumping, Shallow wells, Aquifers, Illinois, Groundwater mining, Groundwater.
Identifiers: *Domestic well costs, *Water treatment costs.

Cost information is given for private residential groundwater supply systems in Illinois. Graphs can be used to make reasonably accurate cost predictions for different types and depths of water supply wells. A typical domestic well in Illinois may be expected to cost about $575. Cost data for pumping systems equipped with 10-gpm submersible pumps show that the average cost of these systems is about $585. The costs of treating water for domestic use also are summarized. Two graphs illustrate the monthly costs of softening and removing iron at varying monthly consumption rates and concentrations of hardness-forming minerals and iron. The monthly cost of continuous chlorination is calculated. Use of the data presented makes it possible to estimate the monthly costs of raw and treated water from a domestic groundwater supply. Two maps show the probable costs of domestic raw water supply systems from sand and gravel wells and bedrock wells throughout the state. For a typical installation and domestic use rate in Illinois, the monthly cost of raw water is about $11.00, softened water $15.40, softened treated for iron $22.00, and softened water treated for iron and chlorinated $25.00. Similar calculations for any type and depth of well, water quality, and treatment can be made from the information in this report. This material should provide adequate information for planning purposes and decision making in developing a desired domestic supply. (Poertner)
W71-08129

CENTRAL FRESNO COUNTY WATER AND LIQUID WASTE PROGRAM. VOLUME V. MATHEMATICAL MODEL FOR GROUNDWATER.
Fresno County Planning Dept., Calif.
For primary bibliographic entry see Field 06B.
W71-08179

EVALUATION AND COMPARISON OF RED FORK SAND WATERFLOOD PROJECTS IN OKLAHOMA,
Bureau of Mines, Washington, D.C.
Kenneth H. Johnston.

Available from the National Technical Information Service as PB-197 105, $3.00 in paper copy, $0.95 in microfiche. Bureau of Mines Report of Investigations 7465, 1970. 45 p.

Descriptors: *Injection wells, *Oil industry, *Oil reservoirs, Oklahoma, *Sandstones, Permeability, Porosity.
Identifiers: *Oil recovery, *Water injection, Drill core analysis, Well completion fluids, Red Fork Sand, *Low permeability sandstone reservoirs.

Information on oil and water production, volume of water injected, core analyses, and well completion data was collected on 28 Red Fork sand waterflood projects for comparison and evaluation of results. An average water injection efficiency of 35 percent, an average water-injected to oil-produced ratio of 16.8:1, and an average loss outside the flood pattern of approximately 45 percent of the injected fluid resulted in an oil recovery to January 1, 1969, of only 5.6 percent of the pore volume, or 9.1 percent of the initial stock-tank oil in place. The principle causes of poor oil recovery from these projects are the losses of large quantities of injection water from the flood patterns through oriented, natural fracture systems or zones of high permeability and excessive channeling of injection fluids from input wells to oil wells. For more efficient operation and a higher percentage of oil recovery from the Red Fork sand and other low-permeability-sand waterflood projects, directional orientation of both induced- and natural-fracture systems should be determined during early development. The success of a low-permeability-sand waterflood project depends to a large extent upon the orientation of the injection wells with the fracture system.
W71-08180

ELECTRIC ANALOG MODEL STUDY OF THE HYDROLOGY OF THE SAGINAW FORMATION IN THE LANSING, MICHIGAN AREA--1963,
Michigan State Univ., Lansing. Dept. of Geology.
Merlin L. Wheeler.
Available from the National Technical Information Service as PB-199 538, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 10, Institute of Water Research, Michigan State University, Dec 1970. 63 p, 24 fig, 4 tab, 5 ref. OWRR Project A-001-MICH (3).

Descriptors: *Analog models, *Groundwater movement, *Hydrologic properties, *Water supply, *Leakage, Piezometry, Data, Pumping.
Identifiers: Steady-state analysis, Transient analysis, Saginaw formation.

An electric analog model was constructed to deal with the problem of groundwater withdrawal by many centralized supply systems from the Saginaw Formation, the primary source of water for domestic and industrial use in the Lansing, Michigan area, which has resulted in a large cone of depression which is expanding rapidly. The initial design of the model utilized data presently available. In order to determine the leakage rate, a steady-state, or equilibrium analysis of the model was initiated using actual conditions, thus eliminating all time-dependent variables from the hydrologic system. The model was then modified for transient analysis until the analog simulation of the decline in the piezometric surface for several periods agreed closely with actual declines. It was also necessary to make a detailed examination of the pumpage from the aquifer. Determination of the leakage that was occurring from the glacial drift, in units of gallons per day square mill per foot of head difference was also made. During the analysis of the model, significant facts were revealed about the hydrology of the Saginaw Formation, most specifically related to aquifer leakage, and was considered a predictive tool in the planning of future water resources development in the Lansing area. (Kriss-Cornell)
W71-08184

4C. Effects on Water of Man's Non-Water Activities

URBAN RUNOFF BY ROAD RESEARCH LABORATORY METHOD (DISCUSSION),
Leonard H. Watkins, Franklin F. Snyder, Harvey W. Duff, and George C. C. Hsieh.
J Hydraulics Div, Am Soc Civil Engrs, Vol 96, No HY7, p 1625-1631, Jul 1970. 2 tab, 4 ref.

Descriptors: *Hydrographs, *Runoff coefficient, Evaluation, Runoff, Rational formula, Storm runoff.
Identifiers: *RRL method, *Urban runoff.

The authors separately discuss aspects of the article included in a previous issue on an application of the Road Research Laboratory method (RRL) for synthesizing urban runoff hydrographs to conditions at three locations in the United States. Leonard Watkins describes the use of this method in Great Britain, concluding that the amounts of runoff found by the American authors agreed with experience in Great Britain. Frank Snyder discusses the theoretical applicability and other features of the RRL method, and he concludes that more analysis is needed in regard to the assumption of a constant runoff coefficient equal to the percentage of impervious area connected to a storm drainage system. He also states that the applicability of the RRL method to urban basins with pervious and unconnected impervious areas for infrequent design storms is limited. Harvey Duff and George Hsieh compare the commonly-used rational method to the RRL method for predicting urban runoff. The RRL method seems to result in more accurate inflow predictions, but both methods predict runoff accurately. The rational method appears easier to use; and when the RRL method is tried, a shorter time increment is recommended. (See also W70-02467)
W71-07841

URBAN RUNOFF BY ROAD RESEARCH LABORATORY METHOD (DISCUSSION),
D. Earl Jones.
J Hydraulics Div, Am Soc Civil Engrs, Vol 96, No HY9, p 1879-1880, Sept 1970.

Descriptors: *Runoff forecasting, *Hydrographs, Methodology.
Identifiers: *RRL method.

The writer states that the Road Research Laboratory method provides a basis for evaluation of potential drainage area responses without prior extensive collection of local urban streamflow records furnishing a simple rationale for estimating flow hydrographs. The RRL model seems advantageous from the standpoints of simplicity, ease of application, minimal data input requirements, and reasonable reliability of results in the common application range. (See also W70-02467)
W71-07844

REAL-TIME COMPUTER CONTROL OF URBAN RUNOFF, (DISCUSSION),
For primary bibliographic entry see Field 08B.
W71-07845

INVESTIGATION OF A WATER SUPPLY NEAR ENCINO, NEW MEXICO, DURING THE STARMET TEST,
Geological Survey, Albuquerque, N. Mex.
J. A. Basler.
Geological Survey Open-file Report, Mar 1971. 15 p, 2 fig, 3 ref.

Descriptors: *Water levels, *Farm ponds, *Explosions, *New Mexico, Stock water, Surface waters, Testing, Water level fluctuations, Precipitation (Atmospheric), Instrumentation, Evaporation, Consumptive use, Data collections, Evaluation.
Identifiers: *Torrance County (N Mex).

The U. S. Air Force has made tests using conv
tional explosives at a site near Encino, Torra
County, New Mexico. The initial high-ene
detonation test was made at the site on Oct
1968. Soon thereafter, the ranch owner expres
concern that the detonation may have adversely
fected a nearby surface-water supply of two po
used for watering stock, about 250 feet south of
test site. Measurements made immediately bef
and after a detonation test, Nov. 4, 1970, indic
that the water levels in the ponds were not affec
by the detonation. The water-level declines
served during a period of several days after
detonation are regular in occurrence and
similar to declines observed for several days p
to the detonation. These declines are attributed
water losses caused by evaporation and st
watering. The relation of the volume of water in
ponds to gains from precipitation, and losses fr
evaporation and from stock watering supports
conclusion, indicated by water-level measu
ments, that the detonation caused no change in
water supply in the ponds. (Woodard-USGS)
W71-07919

**DESERTIFICATION VERSUS POTENTIAL F
RECOVERY IN CIRCUM-SAHARAN TERRI
RIES,**
Cairo Univ., Giza (Egypt). Dept. of Botany.
M. Kassas.
Presented at an international conference, '
Lands in a Changing World,' Tucson, Ariz
June 1969. In: Arid Lands In Transition, Dregn
E (ed), Pub No AAAS, p 123-142, 1970. 4 fig
ref.

Descriptors: *Soil erosion, *Arid lands, *Land
*Vegetation effects, Environmental effects, W
conservation, Soil conservation, Grazing, L
reclamation.
Identifiers: *Desertification, *Sahara Desert.

Desertification is the gradual spread of a desert
adjoining semiarid lands through their deteri
tion. This involves processes of perennial p
cover reduction, floral impoverishment, soil
sion, mobile and sand dune formation and de
pavement establishment. The usual factors resp
sible for this process are livestock overgraz
cereal cultivation, the cutting of woody species
other natural vegetation mismanagem
problems. It is stressed that the dynamic equili
um of vegetation cover in arid and semiarid la
combined with thin soils and low rainfall re
these fragile ecosystems subject to large degen
tive changes as a result of small disturban
Progressive vegetational degeneration is descri
in the midland belt of the Sudan as a result
clearing of native vegetation for the exploita
gum arabic. Due to population pressures such
ploitation is common. A number of plant and w
conservation projects designed to retard the de
tification process are described and critici
These include enclosure experiments, water re
voir construction, water redistribution systems
afforestation. So far, their effectiveness has b
limited. The author calls for an end to destruc
practices and an integrated 'rational' program
land recovery practices. (Casey-Arizona)
W71-08136

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

**GLENODININE, AN ICHTHYOTOXIC S
STANCE PRODUCED BY A DINOFLAG
LATE, PERIDINIUM POLONICUM,**
Tokyo Univ. (Japan). Lab. of Marine Biochem
try.
For primary bibliographic entry see Field 05C.
W71-07731

SSIBLE METABOLITES OF DIELDRIN IN E SAILFIN MOLLIE (POECILIA LATIPIN-
,
mi Univ., Fla. Inst. of Marine and Atmospheric nces.
rles E. Lane, Douglas B. Seba, and W. Lee rn.
ceedings of the Society for Experimental Biolo- nd Medicine, Vol 133, No 4, p 1375-1377, Apr 0. 2 fig, 12 ref. FWPCA Grant No 01326-01.

criptors: *Dieldrin, *Chlorinated hydrocarbon icides, *Pesticide residues, *Metabolism, *Fish iology, Bioassay, Pesticides, Gas chromatog- y, Laboratory tests, Pesticide kinetics, Path of utants, Organic compounds, Fish, Fish toxins, ility.
tifiers: *Poecilia sp., Sailfin molly, Liver abolism.

d generation cultivated sailfin mollies (Poecilia inna) were exposed to 0.012 ppm dieldrin in vater, and tissues were subsequently analyzed gas chromatographic techniques. Two ducts, thought to be metabolites of dieldrin, e detected in extracts of the liver and of various ns. These substances were resistant to alkaline rolysis, more polar than dieldrin, and stable to east 230 degrees (C/F not specified). The ors suggest that the compounds may be par- y dechlorinated cyclo-diene fragments of diel- . (LeGore-Washington)
1-07734

RBON ADSORPTION FOR RECOVERY OF GANIC PESTICIDES,
ironmental Protection Agency, Cincinnatti, o. Analytical Quality Control Lab.
. Eichelberger, and J. J. Lichtenberg.
rnal American Water Works Association, Vol No 1, p 25-27, Jan 1971. 10 ref, 4 tab.

criptors: *Adsorption, Carbon, Organic com- nds, Pollutant identification, *Analytical niques, *Pesticides, Endrin, Organic pesti- s.
tifiers: *Carbon adsorption methods (CAM).

orption and desorption efficiencies of a great y organic compounds are not known yet. For reason the use of CAM alone could not deter- e the concentration of endrin in the Mississippi r. A thorough description of the experiment procedure used are presented. Results of anal- of the grade sample taken at the beginning and of each sample run are tabulated. Analysis of grab samples after passing through the carbon wed no pesticide contents above the detectable l. Some compounds disappeared from the er after 4 days while most of the chlorinated pounds were present in nearly the same con- tration. However, heptachlor, aldrin, DDE, and osulphan showed significant loss. Seven out of organophosphorus compounds were somewhat inished after 4 days. Two tables showing the overy of the compounds by CAM are given. se tables indicate that the CAM is a useful cedure for isolation and measurement of hoxychlor, lindane, endrin, dieldrin, and hep- lor epoxide. It also shows that CAM is not able for recovery of fention, methyl, parathion, athion, ethion, trithion, and methyl trithion. yaan-Texas)
1-07769

D AND COD ANALYSES ON PARAFFINIC DROCARBONS,
versity of Western Ontario, London. Biochemi- Engineering Group.
ajic, O. Spacek, and V. Strizic.
rnal, American Water Works Association, Vol No 12, p 784-786, Dec 1970.

criptors: *Biochemical oxygen demand, emical oxygen demand, *Analytical niques, Kinetics, Design criteria, Mixing, Tem- ature, Oxidation, Incubation.
Identifiers: *Standard methods, *Manometric techniques, Hydrocarbons, Theoretical oxygen demand, BOD 5.

BOD and COD analyses on paraffinic hydrocarbons have long given erroneous results because of separation of the oils from the sample, and the subsequent incomplete oxidation. Hydrocarbons analyzed, including n-Hexane, n-Heptane, n-Decane, n-Dodecane, n-Hexadecane, n-Heptadecane, by the APHA standard BOD and COD analyses yielded values for COD of less than 5.5% of the Theoretical Oxygen Demand (TOD), of the amount of oxygen need to completely oxidize each hydrocarbon to CO2 and H2O. For BOD, the highest analysis was 2.2% of the TOD. Strict observance of the following precautions is required for BOD analyses on straight chain hydrocarbons: (1) pipettes must be chemically clean, and constructed such that oil will not stick to the surface, (2) oils present must not be allowed to separate from aqueous phase; (3) continuous stirring of the BOD bottle during the 5-day test should be practiced if at all possible. The Standard Methods 5-day BOD test has validity for hydrocarbon wastes only if these precautions are strictly observed. At the present time, COD analyses cannot be applied to hydrocarbon wastes, and COD data should be discarded in favor of BOD data obtained in the prescribed manner. (Lowry-Texas)
W71-07772

DEVELOPMENT OF INSTRUMENTAL TECHNIQUES FOR THE ANALYSIS OF TRACE ORGANIC CONSTITUENTS IN WATER,
Connecticut Univ., Storrs.
Ralph P. Collins.
Completion Report, July 15, 1970. 3 p. OWRR Project A-022-CONN (2).

Descriptors: *Gas chromatography, *Analytical techniques, Chromotography, Infrared, Mass spectrometry, *Freeze drying.
Identifiers: Geosmin, Trace organic constituents, *Streptomyces odorifer.

This project was concerned with the development of effective means of isolating, concentrating, identifying, and automating measurements of trace organic constituents in public water supplies. The trace organic constituents were removed from aqueous solution by freeze drying. This procedure avoids chemical, biological, or physical transformations which are inherent in most other methods. The concentrated material is extracted in a liquid-liquid extractor for approximately 72 hours. The petroleum-ether extract is dried, carefully, concentrated, and the concentrated extract is then subjected to gas-liquid chromatography. Infrared spectra and moss spectra were also obtained. Utilizing the procedure developed, earthy-musty odor constituents produced by Streptomyces odorifer were identified; these are trans-1, 10-dimethyl-trans-9-decalol (geosmin) and 2-exo-hydroxy-2-methylbornane. A third important earthy-musty odor compound has not as yet been identified.
W71-07839

SPECTROPHOMETRIC DETERMINATION OF SMALL QUANTITIES OF PHENOLS, (IN RUSSIAN),
Moscow State Univ. (USSR).
A. P. Terentiev, S. I. Obtemperanskaya, and Yu. N. Tikhonov.
English summary. Zhurnal Analiticheskoi Khimii, Vol 25, No 9, p 1815-1818, 1967. 1 fig, 1 tab, 11 ref.

Descriptors: *Oxides, *Phenols, *Spectrophometry, Colorimetry, Analysis, Analytical techniques.
Identifiers: Naphthals, Heterocyclic oxy-compounds.

The introduced spectrophotometric method of determination of oxy-groups in phenols, naphthols and some heterocyclic oxy-compounds is based on the colorimetric reaction of Janovsky. Essentially, the analysis consists of an extraction of 2-4 dinitrophenyl ethers with benzol and addition of acetone and tetramethyl ammonium hydroxide. The dependability of the method was verified by analyses of 26 phenols, including some pharmaceutical compounds. Positive results were not obtained with phenols vulnerable to quinone formations and phenols containing strong electron accepting groups or dinitro-derivatives insufficiently soluble in organic solvents. (Wilde-Wisconsin)
W71-07876

INSTRUMENTATION FOR MEASURING PHYSICAL PROPERTIES OF A LAKE,
Cornell Aeronautical Lab., Inc., Buffalo, N.Y.
For primary bibliographic entry see Field 02H.
W71-07882

ACTIVATION ANALYSIS BY CHARGED PARTICLES (IN SLOVAK),
Slovak Technical Univ., Bratislava (Czechoslovakia); and Magyar Tudomanyos Akademia Kozponti Fizikai Kutoto Intezete, Budapest.
For primary bibliographic entry see Field 07B.
W71-07886

ON OPTIMUM CONDITIONS FOR ULTRASONIC SEPARATION OF DIATOMS OF SANDY BENTHOS (IN FRENCH),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
For primary bibliographic entry see Field 07B.
W71-07892

STREAM POLLUTION EXAMINATION BY BIOLOGICAL TESTS,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia).
Dragica Matulova.
Preprint, Fourth International Conference on Water Pollution Research. Prague, Section 3, Paper 2, p 1-11, 2-6 Sept 196h 5 fig, 1 tab, 22 ref.

Descriptors: *Water pollution examination, *Biological tests, *Streams, Experimental procedures, Bioassay, Toxicity.
Identifiers: *A-Z procedure, *Chlamydomonas, *The Biomass Titre (BMT).

Biological methods for classifying different water pollution levels in streams can be divided into ecological and physiological techniques. The physiological methods, which also include methods for estimation of the toxicity, utilize two main procedures, namely: (1) the exposure of natural populations living in the water under examination, in the same water or in different dilutions of toxic substances; and (2) the exposure of suitable test organisms in the water under examination after removal of the original population. Three methods were described: the A-Z procedure, the biomass titre (BMT), and bioassay with Chlamydomonas. The advantages and disadvantages of each were discussed. (Wahtola-Washington)
W71-07895

THE EFFECTS OF VARYING CONCENTRATIONS OF NUTRIENTS, CHLORINITY, AND DISSOLVED OXYGEN ON POLYCHAETOUS ANNELIDS,
California State Coll., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W71-07899

STEAM FILM SAMPLING OF WATER FOR MASS SPECTROMETRIC ANALYSIS OF THE DEUTERIUM CONTENT,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.; and Atomic Energy of Canada Ltd., Chalk River (Ontario). General Chemistry Branch.

For primary bibliographic entry see Field 02K.
W71-07918

REMOTE SENSING OF LUMINESCENT MATERIALS,
Geological Survey, Washington, D.C.; and Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 07B.
W71-07961

DIRECT DETERMINATION OF THE ELECTROMAGNETIC REFLECTION PROPERTIES OF SMOOTH BRACKISH WATER TO THE CONTINUOUS SPECTRUM FROM 10 TO THE 8TH POWER TO 4 x 10 TO THE 9TH POWER HERTZ,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 07B.
W71-07974

DEVELOPMENT OF A CALIBRATION MODULE FOR TRACE OXYGEN ANALYZERS,
Aerojet-General Corp., El Monte, Calif.
For primary bibliographic entry see Field 08G.
W71-07977

CONCENTRATION OF STRONTIUM-85 AND CESIUM-137 FROM WATER SOLUTIONS BY CLADOPHORA AND PITHOPHORA,
Alabama Univ., University. Dept. of Biology.
Louis G. Williams.
Journal of Phycology, Vol 6, No 3, p 314-316, 1970. 1 tab, 4 ref.

Descriptors: *Radioisotopes, *Algae, *Absorption, Monitoring, Analytical techniques, Laboratory tests, Cesium, Strontium radioisotopes, Ions, Rivers, Cultures, Organic matter, Bacteria, Water analysis.
Identifiers: *Cladophora glomerata, *Pithophora oedogonia.

With the use of packaged live and preserved green algae and other organic materials, radionuclides in natural waterways, not found by the usual methods of analysis of raw water can be detected. Live algae concentrate cesium and strontium ions much more than ion-exchange resins or dead materials. This is significant in the ecology of food webs where radionuclides may be passed on to higher trophic levels. The concentration factors of nonliving organic materials were much lower and varied with the material, not with the calcium/potassium ratio. The effect of high calcium ions and high potassium ions was to lower the uptake of cesium more than strontium. Cladophora and Pithophora were grown in aquaria, packaged live in perforated polyethylene bags and tied submerged in various rivers for periods of 2 to 7 days, after which the contents showed high concentrations of many fission products, including strontium and cesium. Where aquatic environments are unfavorable for live Pithophora or Cladophora, these algae, fixed with merthiolate-iodine preservative, have been shown to be about twice as effective as mixed ion-exchange resins. (Jones-Wisconsin)
W71-08032

COMPARISON OF TWO STORAGE METHODS FOR THE ANALYSIS OF NITROGEN AND PHOSPHORUS FRACTIONS IN ESTUARINE WATER,
Bureau of Commercial Fisheries, Beaufort, N.C. Center for Estuarine and Menhaden Research.
Gordon W. Thayer.
Available from the National Technical Information Service as COM 71-00206, $3.00 in paper copy, $0.95 in microfiche. Chesapeake Science Vol 1, No 3, p 155-158, Sept 1970. 2 tab, 11 ref.
Identifiers: *Nutrients, Storage, *Water analysis, Nutrients, *Estuaries, Water analysis, Refrigerating, Freezing, Phosphates, Nitrates, Nitrates, Ammonia, Quantitative analysis.

The change, during storage, in concentration of dissolved inorganic, dissolved organic, and particulate phosphorus, and nitrate, nitrite, and ammonia in estuarine water was examined in samples that were refrigerated and in samples which were quick-frozen. One half of each set of samples was pretreated with 0.7% v/v chloroform. At all times of the year quick-freezing alone stabilized nutrient concentrations, whereas freezing with chloroform resulted, at times, in significant changes in the nutrient levels. Refrigeration never stabilized all nutrient levels regardless of the presence or absence of chloroform.
W71-08050

NUTRIENT DATA ON SEDIMENT SAMPLES OF THE POTOMAC ESTUARY, 1966-1968,
Environmental Protection Agency, Annapolis, Md. Water Quality Office.
James W. Marks, and Orterio Villa, Jr.
Chesapeake Technical Support Laboratory Data Report No 11, 1970. 20 p, append.

Descriptors: *Nutrients, *Bottom sediments, *River beds, *Estuaries, *District of Columbia, Virginia, Maryland, Sampling, Methodology, Analysis, Analytical techniques, Phosphorus, Nitrogen, Chemical oxygen demand, Chlorophyll, Data collections, Sediments.
Identifiers: *Potomac estuary, *Potomac river.

During the years of 1966 through 1968 the Chesapeake Technical Support Laboratory, conducted three separate surveys of the bottom sediments of the tidal portion of the Potomac River to determine the existing quality of the river bottom. The results of these investigations are presented and the sampling procedures and analytical methods are described. In 1966 the Potomac River between the 14th Street Bridge in Washington, D.C. to the U.S. Route 301 Bridge near Morgantown, Maryland, was sampled three times, March-May, June-August and September-October. In 1967 the same portion of the river was sampled twice, March-April and again during September. In 1968 the river between the U.S. Route 301 Bridge to the mouth of the river at Point Lookout was sampled once during February. The parameters measured include total phosphorus, inorganic phosphorus, total nitrogen, ammonia nitrogen, chemical oxygen demand, wet weight, dry weight, volatile weight and chlorophyll a. (Woodard-USGS)
W71-08078

SUMMARY OF ENVIRONMENTAL MONITORING AT AMES LABORATORY, 1962-1969,
Environmental Protection Agency, Rockville, Md. Radiation Office.
J. J. Copp.
Radiological Health Data and Reports, Vol 12, No 3, p 119-128, Mar 1971. 10 p, 3 fig, 10 tab, 7 ref.

Descriptors: *Pollutant identification, Environmental effects, *Radioactive waste, *Monitoring, *Radioactivity effects, Analytical techniques, Iowa, Surface waters, Groundwater, Soils, Vegetation, Atmosphere, Sediments, Radiation, Sampling, Data collections.
Identifiers: *Environmental pollution, *Ames Laboratory Research Reactor facility, Iowa State University.

The Ames Laboratory Research Reactor facility (ALRR), operated for the U.S. Atomic Energy Commission by the Iowa State University of Science and Technology, reached full power in July 1965. The preoperational and present environmental monitoring program consists of gross alpha and gross beta radioactivity determinations in air, soil, vegetation, river water, ALRR outfall, river bottom sediment, precipitation, well water, and pond water samples. River water samples are collected weekly and analyzed for gross alpha and gross beta radioactivity. One-liter samples are filtered and counted separately as suspended and dissolved solids. Yearly averages for gross beta radioactivity in suspended and dissolved solids in river water samples for each sampling site from 1963 to 19 are tabulated. The environmental sampling p gram is maintained to provide information rega ing the effectiveness of control measures and determine whether any radiological changes in environment are the result of laboratory ope tions. (Woodard-USGS)
W71-08080

ON THE BALANCES OF Sr-90 AND Cs-137 THE BALTIC SEA,
Institute of Marine Research, Helsinki (Finlan and Institute of Radiation Physics, Helsinki (F land).
Aarno Voipio, and Anneli Salo.
Nordic Hydrology, Vol 2, No 1, p 57-63, 1971. 2 fig, 1 tab, 15 ref.

Descriptors: *Fallout, *Strontium radioisotop *Cesium, *Sea water, Surveys, Geochemis Water chemistry, Path of pollutants, Wa balance, Radioisotopes, Radiochemical analy Distribution patterns.
Identifiers: *Finland, *Baltic Sea.

The total amounts of Sr-90 and Cs-137 that ac mulated in the water of the Baltic Sea in the ye 1960-67 are estimated on the basis of 10-15 sa ples collected annually. There are no signific sources of the radionuclides in the area other t atmospheric deposition on land and sea surfa The amounts of nuclides transported by the c flow through the Danish Sounds were evalua from the nuclide concentrations found in the s face waters of the southern Baltic and the Dan Sounds, and the mean outflow. The estima balance of strontium-90 based on the present d is in accordance with the known fact that the str tium concentration is a conservative property sea water. The estimate does not indicate any re removal of cesium-137 from Baltic Sea water geochemical or biological processes. (Kna USGS)
W71-08086

WATER QUALITY EVALUATION OF T MIDDLE RIVER ROUGE BASIN.
Michigan Water Resources Commission, Lans Dept. of Conservation.

Michigan Water Resources Commission, Dep ment of Conservation, Lansing, Oct 1967. 59 p, fig, 14 tab, 11 ref.

Descriptors: *Water quality, *Water pollution c trol, *Water pollution effects, *Waters management, *On-site investigations, Erosion c trol, Michigan, Impaired water quality, Water an ysis, Water quality control, Water quality Michigan.
Identifiers: *Middle River Rouge (Mich), Wa County (Mich).

The water quality of flows in the Middle Ri Rouge was studied, based upon water samples c lected at 18 locations on the river. The Ri Rouge basin is located in the southeastern port of Michigan's Lower Peninsula, principally Wayne County. The area drained by the Mid River Rouge is approximately 117 square miles was found that the water quality of the Mid River Rouge, particularly in its lower reaches seriously degraded. Indications of this degradat are: low dissolved oxygen concentration; high c centrations of oxygen demanding 5-day BOD s stances, inorganic nutrients, coliform bacteria, visible films of oil. The causes of water qua degradation include combined sewer diversi trash accumulation, industrial waste discharge soil erosion. Heavy use is made of the river and jacent land areas. Recreational uses are of pr importance. These uses will probably increase the future and a higher quality of water will required to meet the standards set for these u The report includes descriptions of Basin char teristics, developments within the Basin, causes water quality deterioration and implicati

reof, and suggestions for correcting the causes vater quality deterioration. The corrective mea- es suggested include: providing incentives to tractors to adopt practices that minimize soil sion; encouraging municipalities to treat waste er and reduce combined sewer overflows; inate improperly treated and untreated indus- l waste water discharges; and preventing trash umulations that contribute to stream con- ination. (Poertner)
1-08128

E SOURCE IDENTIFICATION OF MARINE DROCARBONS BY GAS CHROMATOG- PHY,
ods Hole Oceanographic Institution, Mass.
nfred Ehrhardt, and Max Blumer.
erican Chemical Society National Meeting, Los geles, California, Mar 28 - Apr 2, 1971. 8 fig, 2 23 ref.

criptors: *Oil wastes, *Gas chromatography, ter pollution sources, Oceans, Water pollution, radation, Chromatography, Analytical niques, Fuels, *Pollutant identification.
ntifiers: *Marine Hydrocarbons, *Source ntification.

annual oil spillage rate into oceans is between nd 10 million tons of oil. Legislative and execu- actions to reduce oil pollution in the seas will end upon techniques for identifying the pollut- sources. The technique described here is de- ing the hydrocarbon compositional differences il and oil products by gas chromatography. Gas omatograms of eight crude oils are produced. v this method distinguishes between recent, genic hydrocarbons and fossil fuels is discussed. role of oil degradation by evaporation, dissolu- , bacterial degradation, and chemical degrada- is examined. The potential of oil spill identifi- on by gas chromatography is exemplified by lysis of two beach tars, one from the shores of muda, and the other from the shores of rtha's Vineyard, Massachusetts. (McEntyre-)
1-08155

ORIDA MIDDLE GROUND,
rida State Univ., Tallahassee. Dept. of Oceanog- ny.
primary bibliographic entry see Field 02L.
1-08159

LD DETERMINATION OF BACTERIAL DIS- PEARANCE IN SEAWATER,
hnical Univ. of Denmark, Lyngby. Dept. of itary Engineering.
l Harremoes.
er Research, Vol 4, No 11, p 737-749, Nov 0. 8 fig, 2 tab, 5 ref.

criptors: *Coliforms, *Sea water, *On-site in- igations, *Public health, Data collections, age bacteria, Sewage effluents, Tracers, pling, Bacteria, *Pollutant identification.
ntifiers: Bacterial disappearance, Continual er release, Instantaneous tracer release.

cern arises for bathing hazards in seawater con- inated by viable bacteria from sewage harges into the sea. Seawater is, however, lethal oliform bacteria but causes for this are insuffi- tly known. Two methods are presented for field rmination of bacterial disappearance in sea- er with an inaccuracy of less than 10 per cent. method consists of a continuous conservative er release into the sewage outflow with simul- eous sampling for bacterial counting and moni- ng of dilution. A case study of Gentofte in The nd between Denmark and Sweden is presented g this first method. The second method of rmining bacterial disappearance consists of an antaneous tracer release into the sewage out- and measurements taken whereby the disap- rance rate equals the ratio between tracer dis- appearance and bacterial disappearance from the surface layer. A case study of Manila Bay is presented using this second method. In both methods the rate of disappearance is defined on the basis of continuity--the ratio between the bacterial flux as measured and the bacterial flux as would have been if no disappearance were taking place. (McEntyre-PAI)
W71-08160

SANITARY-BIOLOGICAL INVESTIGATIONS OF COASTAL SEA WATER AROUND NORTH SEA ISLAND OF SYLT (IN GERMAN),
Kiel Univ. (West Germany). Institut fuer Biokli- matologie und Meeresheilkunde.
J. Peters.
Helgolaender Wissenschaftliche Meeresunter- suchungen, Vol 21, No 3, p 310-319, Dec 1970. 1 fig, 2 tab, 12 ref.

Descriptors: *Sewage bacteria, *Beaches, *Public health, *Pathogenic bacteria, On-site investiga- tions, Sewage effluents, Water pollution, Human pathology, Coliforms, Oceans, Bacteria, Data col- lections, *Pollutant identification.
Identifiers: *Island of Sylt, *North Sea, Germany.

The island of Sylt is an important German recrea- tion center in the southern North Sea. The sewage from the island's villages is emptied directly into the sea waters between the island and the German coast. A study was made in 1967 and 1968 to deter- mine if sewage pollution occurred at the beaches of Sylt's open sea coast. Chemical qualities, a general bacterial count, and coli-titre of 225 water samples were taken around the island to determine the water quality for bathing. Results showed that ex- cept for narrow areas left and right of the sewage outlets of the four sewage plants, the upper limit of bacterial number and of the coli-titre was not reached. Coli-titre comparisons revealed a tidal drift of sewage-contaminated waters from the 'Wattenmeer' coast to the open sea beach. While the general number of bacteria depends on organic matter concentration, the absolute number of sewage bacteria can be estimated only by the coli- titre. A continual check of the pathogenic sewage bacteria, Bacterium coli and the coliform bacteria, in the sea water is necessary for public health. (Mc Entyre-PAI)
W71-08162

WHY DOES IT SMELL SO BAD,
Wisconsin Univ., Madison. Dept. of Agricultural Engineering.
Clyde L. Barth.
Paper presented at the 1970 Annual Meeting American Society of Agricultural Engineers, ASAE 70-416. 22 p, 5 fig, 1 tab, 65 ref.

Descriptors: *Odor, Farm wastes, Pollutants, Strength, Temperature, Instrumentation, Measure- ment.
Identifiers: *Smell, Olfactory mechanism, Percep- tion, Theories, Literature, Odor quality, Stimuli.

Researchers must learn more about manure odor production and control. Many unanswered problems face the farmer now. A review of per- tinent literature clarifies the present status of the knowledge of odor perception, and creates an awareness of the pitfalls to be avoided in planning, conducting and analyzing odor related research. (Christenbury-Iowa State)
W71-08213

5B. Sources of Pollution

AN EVALUATION OF THE 1968 FISH KILL IN THE DES MOINES RIVER BELOW DES MOINES,
Iowa State Dept. of Conservation. Biology Section.
For primary bibliographic entry see Field 05C.
W71-07730

CLEVELAND FACES POLLUTION SUIT.
For primary bibliographic entry see Field 05G.
W71-07853

'BEEHIVES' PROTECT SNOW-REMOVAL SALT AND PREVENT WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W71-07859

EFFECT OF SEASONAL EFFLUENT CHLORINATION ON COLIFORMS IN JAMAICA BAY,
For primary bibliographic entry see Field 05F.
W71-07873

LEACHING OF NUTRIENTS BY DRAINAGE WATERS,
Litovskaya Selskokhozyaistvennaya Akademiya SSR, Kaunas.
Z. B. Kinderis.
Trans. from Pochvovedeniye, No 2, 1970. Soviet Soil Science, No 1, p 99-108, 1970. 1 fig, 4 tab, 19 ref.

Descriptors: *Nutrients, *Soils, *Leaching, *Aquifer characteristics, Soil analysis, Test procedures, Chemical properties, Groundwater, Soil water, Solubility, Soil water transmissivity.
Identifiers: Lithuania (USSR).

Samples of water were periodically collected from tile drainage system established in a weakly pod- zolized diorn-gley soil. Analyses included deter- mination of potassium, sodium, calcium, magnesi- um, and carbonate, nitrate, sulfate, and chloride radicals. The removal of chemical constituents varied depending upon the season and meteorolog- ical conditions, rate of water discharge, nature of crops, and fertilizer treatments. (Wilde-Wisconsin)
W71-07887

NUTRIENT SUPPLY AND PRIMARY PRODUCTION IN CLEAR LAKE, EASTERN ONTARIO,
Trent Univ., Peterborough (Ontario).
D. W. Schindler, and J. E. Nighswander.
Journal Fisheries Research Board of Canada, Vol 27, No 11, p 2009-2036, 1970. 16 fig, 11 tab, 57 ref.

Descriptors: *Precipitation (Atmospheric), *Nutrients, *Primary productivity, *Phytoplank- ton, Productivity, Oligotrophy, Standing crop, Chemical properties, Water pollution sources, Nitrogen, Phosphorus, Eutrophication, Calcium, Ions, Magnesium, Fertility, Watershed manage- ment, Lakes, Limnology, Evapotranspiration, Run- off, Chrysophyta, Cyanophyta, Pyrrophyta.
Identifiers: *Clear Lake (Ontario), *Canadian Shield, Morphometric features.

Phytoplankton production in a small Canadian Shield Lake, largely uninfluenced by humans, was studied in relation to physical, chemical, and geological factors. Primary production is extremely high for a lake with low phytoplankton standing crop and nutrient supply and production is not reflected in the chemical regimes normally used as indicators of lake metabolism. Production during the ice-free season ranged from 0.10 to 2.57 grams carbon/sq m per day and averaged 250 grams car- bon/sq m per year for the lake as a whole. Lim- nologically, Clear Lake is a typical oligotrophic lake. The high production values are partially ex- plained by the high correction for filtration error which averaged 3.2 times for all occasions tested. Since the Clear Lake system has no inlet streams from other lakes, a single discrete outlet, and little or no groundwater flow, a nutrient 'loading rate' could be calculated. Vegetation is lush probably reflecting higher annual precipitation in the area. Major source of supply of the nutrients, nitrogen and phosphorus, and calcium and magnesium, is at- mospheric precipitation. Sodium potassium, and silica apparently enter from terrestrial watershed. (Jones-Wisconsin)
W71-07890

PHOSPHORUS IN WATER AND WASTE WATER-AN ANNOTATED SELECTED BIBLIOGRAPHY,
North Carolina Univ., Chapel Hill. Waste water Research Center.
Linda W. Little.
Waste water Research Center Report No 11, Nov 1970. 118 p. FWRA Contract No 14-12-505.

Descriptors: *Bibliographies, *Water pollution sources, *Water pollution effects, *Water pollution control, *Phosphorus, Nitrogen, Soils, Effluents, Aquatic productivity, Chemical reactions, Analysis, Sewage treatment.
Identifiers: Phosphorus removal, Phosphorus analysis, Biological effects.

This volume comprises a selected annotated bibliography pertinent to sources of phosphorus in water and waste water, effects of phosphorus on aquatic systems, behavior of phosphorus in soils and waters, phosphorus analysis, and removal of phosphorus from waste water. Contains 281 entries. (Wilde-Wisconsin)
W71-07894

STREAM POLLUTION EXAMINATION BY BIOLOGICAL TESTS,
Vysoka Skola Chemicko-Technologicka, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05A.
W71-07895

THE EFFECTS OF VARYING CONCENTRATIONS OF NUTRIENTS, CHLORINITY, AND DISSOLVED OXYGEN ON POLYCHAETOUS ANNELIDS,
California State Coll., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W71-07899

INFLUENCES OF STRIP MINING ON THE HYDROLOGIC ENVIRONMENT OF PARTS OF BEAVER CREEK BASIN, KENTUCKY, 1955-66,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07935

PRECIPITATION AND RUNOFF,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07936

GROUNDWATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07937

GEOCHEMISTRY OF WATER,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07938

EROSION AND SEDIMENTATION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07939

REMOTE SENSING OF LUMINESCENT MATERIALS,
Geological Survey, Washington, D.C.; and Perkin-Elmer Corp., Norwalk, Conn.
For primary bibliographic entry see Field 07B.
W71-07961

BIOLOGICAL SURVEY OF THE EFFECTS OF URANIUM MILLING WASTES ON THE WATER QUALITY OF THE SERPENT RIVER BASIN,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05D.
W71-08011

DEFINING THE PROBLEM FOR INDUSTRIAL WASTE HANDLING AT HIRAM WALKER AND SONS LTD.,
Hiram Walker and Sons Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 05G.
W71-08023

THE EFFECTS OF RETURN IRRIGATION WATER ON THE BASAL LENS IN KAHUKU PLANTATION, OAHU AND PIONEER MILL AND HAWAIIAN COMMERCIAL AND SUGAR COMPANY PLANTATIONS ON MAUI,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 05C.
W71-08044

CONCENTRATIONS OF POLLUTANTS IN AGRICULTURAL RUNOFF,
Texas Tech. Univ., Lubbock. Dept. of Civil Engineering; and Texas Tech. Univ., Lubbock. Dept. of Chemistry.
Dan M. Wells, Ellis W. Huddleston, and Robert G. Rekers.
Partially supported by FWQA. Water Resources Bulletin, Vol 7, No 1, p 124-132, Feb 1971. 9 p, 3 tab.

Descriptors: *Lakes, *Water quality, *Texas, *Farm wastes, *Water pollution sources, Runoff, Nutrients, Solutes, Nitrates, Phosphates, Herbicides, Pesticides, Playas, Overland flow.
Identifiers: Agricultural runoff.

Eighteen rural lakes in Lubbock County, Texas, were sampled on a routine basis following runoff-producing rainfall for a period of approximately eighteen months to determine whether or not runoff from intensively farmed agricultural areas contained significant concentrations of nitrates, phosphates, herbicides, or insecticides. An additional fifteen lakes lying within a triangle bounded by the cities of Plainview, Canyon, and Hereford, Texas, were sampled one time during the summer of 1969 to provide additional data regarding the nature and extent of the potential problem in an area with a different soil type and a slightly different cropping pattern. Based on results of detailed analyses of approximately two hundred samples of water collected from the lakes and an equal number of sediment samples collected from the same lakes at the same time, it appears that the concentrations of all chemical pollutants in runoff from agricultural lands in the High Plains are well below the allowable concentrations for drinking water. (Knapp-USGS)
W71-08053

HYDROLOGY OF THE YTHAN ESTUARY WITH REFERENCE TO DISTRIBUTION OF MAJOR NUTRIENTS AND DETRITUS,
Aberdeen Univ., Newburgh (Scotland). Culterty Field Station.
For primary bibliographic entry see Field 02L.
W71-08062

HYDROGRAPHIC OBSERVATIONS IN THE EASTERN IRISH SEA WITH PARTICULAR REFERENCE TO THE DISTRIBUTION OF NUTRIENT SALTS,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
P. G. W. Jones, and A. R. Folkard.
Journal of the Marine Biological Association of the United Kingdom, Vol 51, No 1, p 159-182, Feb 1971. 24 p, 10 fig, 3 tab, 20 ref.

Descriptors: *Path of pollutants, *Nutrients, *Phosphates, *Nitrates, *Sea water, Industrial wastes, Runoff, Farm wastes, Productivity, Fish, Fisheries, Hydrography, Oceanography, Salinity, Water analysis.
Identifiers: *Irish Sea.

A series of surveys investigating the distribution o nutrient salts in the eastern Irish Sea was mad between May 1965 and April 1968, concentrati on the winter and early summer period. During th winter, the greatest concentration of nutrient sal occurred in the low-salinity inshore water. Plan ton production considerably modified the distrib tion of nutrient salts during the summer, maskin the relationship with salinity. An area of very hig phosphate values was found off St. Bees Head ar was traced to effluent from a nearby chemic works. The distribution of one nutrient salt ratio another was studied during the winter survey. Th N:P and Si:P ratios were related to salinity an hence to the degree of terrestrial runoff. The N: ratio did not conform to this pattern. The curre systems of the area may be subject to variation. (K napp-USGS)
W71-08063

A STUDY ON CHANGES IN QUALITY OF UN DERGROUND WATER,
Tabela House, Kota (India). Agricultural Chemi try Section.
B. L. Darra, Harvinder Singh, and R. S. Mendirat
Journal of Soil and Water Conservation in Indi Vol 18, Nos 1 and 2, p 1-3, Jan-June 1970. 3 p, tab, 6 ref.

Descriptors: *Water quality, *Return flo *Groundwater, *Saturated soils, *Irrigation e fects, Leaching, Water level fluctuations, Salin soils, Land reclamation, Path of Pollutants.
Identifiers: *India.

Underground well waters were collected in pre an post seasons to assess the changes brought about quality of waters in the two irrigation seasons und saline and saline-alkali water logged areas of Bun district of Chambal command, India. The quality water slightly improved after rains, while in anoth part it was slightly impaired. The canal water is good quality. Efforts are in progress to decrease th salt contents of the surface by leaching and flushi aided by lowering the water table using surfa drainage facilities. Simultaneously other soil rec mation measures have also been undertaken boost crop production. (Knapp-USGS)
W71-08073

SUMMARY OF ENVIRONMENTAL MONITO ING AT AMES LABORATORY, 1962-1969,
Environmental Protection Agency, Rockville, M Radiation Office.
For primary bibliographic entry see Field 05A.
W71-08080

THE SOURCE IDENTIFICATION OF MARIN HYDROCARBONS BY GAS CHROMATO RAPHY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05A.
W71-08155

POLLUTION SYMPOSIUM,
Office of Naval Research, London (England).
John D. Costlow, Jr.
Available from the National Technical Informati Service as AD-823 621, $3.00 in paper copy, $0.5 in microfiche. ONRL Conference Report C-21-6 21 Nov 1967. 6 p.

Descriptors: *Water pollution, *Marine fisheri *Oceans, Hydraulic models, Fishes, Meta Radioactive wastes, Oil wastes.
Identifiers: *North sea, Marine biology.

An account is given of the three-day symposiu 'Biological and Hydrographic Problems of Wat Pollution in the North Sea' held at Helgoland, Ge many in September 1967. The forty papers whi were presented considered various aspects of t major sources of pollution, the biological a hydrographical processes determining the fate pollutants, the biological and hydrographical co

ences of pollution, and general and local cts of pollution.
1-08167

MAL WASTES,
lph Univ. (Ontario). Dept. of Soil Science.
. Webber.
nal of Soil and Water Conservation. Vol 26, , p 47-50, Mar-Apr 1971. 21 ref.

criptors: *Farm wastes, *Disposal, Pollutants, ution abatement, Groundwater, Farm lagoons, tment, Anaerobic digestion, Aerobic treat-, Management, Water pollution sources.
tifiers: Contamination, Feedlots, Waste oval, Composting.

e waste management problems resulting from density confinement of livestock are ssed. Treatment and disposal of the waste rial causes the most troublesome problems. e are many systems in use, with anaerobic or ic lagoon treatment more common. Man has s used land as the ultimate disposal medium any kinds of waste. Agriculture finds itself in challenging position of being able to use or se of vast quantities of animal wastes without ting the water, soil, or air. (Christenbury-Iowa)
-08205

TLE FEEDLOT RUNOFF - ITS NATURE VARIATION,
as State Univ., Manhattan. Dept. of Agricul-Engineering.
Miner, R. I. Lipper, L. R. Fina, and J. W.
al Water Pollution Control Federation, Vol 1582-1591, 1966. 8 fig, 11 tab, 12 ref.

riptors: *Farm wastes, *Runoff, *Bacteria, e, Simulated rainfall, Hydrographs, Chemical en demand, Biochemical oxygen demand, gen, Temperature, Pollutants, Water pollu-ources.
fiers: Kjeldahl nitrogen, Feedlot runoff, nded solids, Chemical quality, Most probable er.

ff from cattle feedlots is a high-strength or-waste produced during and immediately after ll. These studies indicated that greatest pollu-concentrations are obtained during warm er, during periods of low rainfall intensity, hen the manure has been made soluble by g with water. Correlations were developed to t runoff oxygen demand and nitrogen con-ased on these factors. In addition, the follow-ints were demonstrated: (1) Feedlot runoff is rce of high concentrations of bacteria nor-considered as indices of sanitary quality, and noff from a concrete-surfaced lot was more y polluted than that from a nonsurfaced lot similar conditions. (Christenbury-Iowa

08206

AMINATION OF SURFACE WATERS PLOWED-IN FEEDLOT MANURE,
s State Univ., Manhattan. Dept. of Agricul-Engineering.
ipper, H. L. Manges, and Eugene Goering.
presented at the 1971 Mid-Central Meeting can Society of Agricultural Engineers, Paper C-71-803. 4 p.

iptors: *Farm wastes, *Disposal, Confine-pens, Pollutants, Runoff, Chemical oxygen d, Water pollution sources.
fiers: *Feedlot manure, Plowed-in.

a four-inch layer of beef feedlot manure was etely covered with 2 to 3 inches of soil in est plots, no organic contamination of water soil surface resulted when plots were well d. Under conditions simulating standing water on tight soil, COD of the water was very high. (Christenbury-Iowa State)
W71-08215

NITRATE AND OTHER WATER POLLUTANTS UNDER FIELDS AND FEEDLOTS,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
B. A. Stewart, F. G. Viets, Jr., G. L. Hutchinson, and W. D. Kemper.
Environmental Science and Technology, Vol 1, No 9, p 736-739, 1967. 2 fig, 1 tab, 1 ref.

Descriptors: *Nitrates, *Water pollution sources, Leaching, Farm wastes, Groundwater, Hydraulic conductivity.
Identifiers: Organic carbon, Feedlots.

Agriculture's effect on nitrate pollution of groundwater was investigated in the South Platte valley of Colorado. The valley is intensively farmed and contains many concentrated livestock feeding operations. A water table, generally between 3 and 20 meters below the surface, underlies much of the area. The average total nitrate-nitrogen to a depth of 6.7 meters in the profiles for the various kinds of land use was: alfalfa (Medicago sativa) (13 cores), 70; native grassland (17 cores), 81; cultivated dryland (21 cores), 233; irrigated fields not in alfalfa (28 cores), 452; and feedlots (47 cores), 1282 kg. per hectare. Groundwater samples often contained high concentrations of nitrate, and those obtained beneath feedlots contained ammonium-nitrogen and organic carbon. Data presented show that nitrate is moving through the soil and into the groundwater supply under both feedlots and irrigated fields in crops, excluding alfalfa. (Parker-Iowa State)
W71-08218

ELECTRIC POWER AND THERMAL DISCHARGES; THERMAL CONSIDERATIONS IN THE PRODUCTION OF ELECTRIC POWER.

Merril Eisenbud and George Gleason, (eds). New York, Gordon and Breach, 1971. 423 p.

Descriptors: *Thermal powerplants, *Thermal pollution, *Electric power demand, *Environmental effects, *Water quality control, *Heated water, *Temperature, *Regulations, *Cooling, Conservation, Beneficial use, Cooling water, Evaporation, Convection, Radiation, Design criteria, Rivers, Estuaries, Mixing, Condensers.
Identifiers: *Cooling systems, *Waste heat utilization, *Waste heat dissipation.

The purpose of the symposium was to bring together experts from industry, the universities and laboratories, and the government to assess the state of our knowledge of the environmental impact of heated discharges from thermal powerplants. The general topics covered include the description of the relationship between electric power and the environment; projected demand for electric power and thermal output; the effects of temperature variations on the aquatic ecosystems; the scientific rationale for federal and state water quality standards; the impact of environmental considerations on the design and operation of power facilities; the technological alternatives for minimizing waste heat rejection; and, the beneficial utilization of waste heat. (See also W71-08299 thru W71-08316) (Oleszkiewicz-Vanderbilt)
W71-08298

THE POWER INDUSTRY AND THE ENVIRONMENT,
Public Service Co. of New Hampshire, Manchester.
William C. Tallman.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, 1971, p 1-5.

Descriptors: *Electric power demand, *Electric power industry, *Environmental effects, *Thermal powerplants, Thermal pollution.
Identifiers: Electric Power Council on Environment.

The paper presents the basic objectives of the Electric Power Council on Environment established in September, 1969: (1) to promote and coordinate electric utility programs in the environment field, (2) to encourage communication between the electric power industry and all others concerned with the environment, and (3) to stimulate research and to make recommendation in regard to environmental considerations. In the discussion of electric power and the environment, the author points out that the electric energy component is now about 20-25% of the total and is growing at a rate about 2 1/2 times faster than is the total use of energy. It is expected that by the year 2000 electric energy will represent about 50% of all energy utilized. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08299

THE POWER ENVIRONMENT OF THE 1970'S,
Department of Water and Power, Los Angeles, Calif.
Floyd L. Goss.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, 1971, p 7-19.

Descriptors: *Electric power demand, *Electric power industry, *Thermal powerplants, *Environmental effects, *Thermal pollution.
Identifiers: National Electric Reliability Council.

After presentation of the status and activities of the recently formed National Electric Reliability Council (NERC), the author states that by 1980 new generating capacity will be installed at a rate of 46,000 Mw per year, which is expected to increase to 66,000 by 1985. Bearing in mind the beneficial effects of installed capability, the author points out that many of the proposed restrictions on the environment are based on mere supposition. Some results of actual operating experience can differ radically from theoretical predictions: (1) both king salmon, striped bass and opossum shrimp can be passed through the operating condensers of a power plant with a high survival rate; (2) the temperature increase imposed by thermal discharges in tide waters does not cause changes in the DO content of the water; (3) natural temperature flutuations in Californian bays and open ocean may vary greatly and considerably exceed those resulting from the thermal power plant's discharges. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08300

ELECTRIC POWER AND THERMAL OUTPUT IN THE NEXT TWO DECADES,
Federal Power Commission, Washington, D.C.
F. H. Warren.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, 1971, p 21-46. 2 fig, 7 tab.

Descriptors: *Electric power demand, *Thermal power plants, *Environmental effects, *Thermal pollution, *Cooling towers, Cooling water.
Identifiers: Federal Power Commission, *Waste heat, Cooling ponds.

Estimates of potential waste heat output and related cooling needs in six basic regions of the United States are presented. Four methods of cooling have been considered in the periods 1971-1980 and 1981-1990: fresh water once-through cooling; fresh water cooling ponds; fresh water evaporative cooling towers; and once-through cooling using saline water. Detailed analysis of presented data is followed by the conclusions that continual assessment of the benefit-to-cost ratio will provide the best guide for decisions in critical judgment cases.

The high ratio of waste heat to useful electrical energy generated emphasizes the need to press every possible means of improving the efficiency of present generating systems. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08301

SPECTRUM OF BIOLOGICAL CONCERNS FROM POWER PLANT THERMAL DISCHARGES,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 05C.
W71-08302

IMPACTS OF THERMAL ALTERATIONS ON ESTUARINE AND COASTAL ENVIRONMENTS,
Virginia Inst. of Mari ne Science, Gloucester Point.
For primary bibliographic entry see Field 05C.
W71-08303

BENEFICIAL USES OF WARM WATER DISCHARGES IN SURFACE WATERS,
Texas A and M Univ., College Station. Dept. of Wildlife Science.
For primary bibliographic entry see Field 03C.
W71-08304

WATER QUALITY STANDARDS: ENFORCEMENT AND COMPLIANCE,
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-08305

PRACTICAL IMPLICATIONS OF APPLYING CRITERIA IN A VARIETY OF CONDITIONS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-08306

THERMAL WASTE TREATMENT AND CONTROL,
Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab.
For primary bibliographic entry see Field 05D.
W71-08307

DEVELOPING AND APPLYING STANDARDS AT THE STATE LEVEL,
Pennsylvania Dept. of Health, Harrisburg. Div. of Water Quality.
For primary bibliographic entry see Field 05G.
W71-08308

CONSIDERATIONS IN TRANSLATING ENVIRONMENTAL CONCERN INTO POWER PLANT DESIGN AND OPERATION,
Duke Power Co., Engineering Department.
For primary bibliographic entry see Field 05D.
W71-08309

POWER PLANT COOLING IN PERSPECTIVE,
Commonwealth Associates, Inc., Jackson, Mich. Architectural and Engineering Systems.
For primary bibliographic entry see Field 05D.
W71-08310

SHORT TERM PROSPECTS FOR IMPROVING EFFICIENCY OF POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 08C.
W71-08311

ENVIRONMENTAL INFLUENCE ON POWER OPERATION,
American Electric Power Service Corp., New York.
For primary bibliographic entry see Field 05G.
W71-08312

NATURAL BODIES OF WATER FOR COOLING,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 05D.
W71-08313

COOLING TOWERS FOR LARGE STEAM-ELECTRIC GENERATING UNITS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W71-08314

THE USE OF RIVER MODELS IN POWER PLANT HEAT EFFECT STUDIES,
Worcester Polytechnic Inst., Mass. Alden Research Labs.
Lawrence C. Neale.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 381-416, 1971. 14 fig, 3 photos.

Descriptors: *Model studies, *Thermal powerplants, *Temperature, *Test procedures, Instrumentation, Froude Number, Reynolds number, Isotherms, Rivers, Estuaries, Reservoirs.
Identifiers: *Distorted models, Temperature sensors.

A number of river model studies have been undertaken at the Alden Research Laboratories to determine the influence of heated water effluents on bodies of water. The flow patterns developed from these model studies have been used to predict the flow patterns and temperature patterns in the prototype. Although it is difficult to obtain detailed data from the field after completion of projects, the results that have been obtained indicate good agreement with those of the distorted model study. Receiving water temperature ranged from 32F and temperature differentials produced by condenser cooling have varied from 0 deg to 45F. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08315

UTILIZING WASTE HEAT FOR URBAN SYSTEMS,
Westinghouse Corp., Philadelphia, Pa. Environmental Systems Dept.
For primary bibliographic entry see Field 03C.
W71-08316

STRATIFICATION OF FLOW FROM CHANNEL INTO DEEP LAKE, (DISCUSSION),
New South Wales Univ., Kensington (Australia). Water Research Lab.
For primary bibliographic entry see Field 08B.
W71-08321

5C. Effects of Pollution

STUDIES ON THE TOXICITY OF HEAVY METALS TO AQUATIC ANIMALS AND THE FACTORS TO DECREASE THE TOXICITY--I. ON THE FORMATION AND THE TOXICITY OF PRECIPITATE OF HEAVY METALS (JAPANESE),
Kenji Tabata.
Bulletin of Tokai Regional Fisheries Research Laboratory, No 58, p 203-214, May 1969. 4 fig, 3 tab, 16 ref.

Descriptors: *Heavy metals, *Hydrogen ion concentration, *Toxicity, *Water pollution effects, Aquatic animals, Calcium, Bicarbonates, Magnesium, Water pollution treatment, Mollusks, Mussels, Shellfish, Daphnia, Fish toxins, Killifishes, Nekton, Mortality, Solutes, Bioassay, Ions, Ion transport.
Identifiers: *Zinc, Metals, Cations, Precipitates, Gobies.

Experiments were designed relative to the solubi
ty of Zn...., the factors controlling it and the toxici
of zinc precipitate. The authors found that t
precipitate's effect on Japanese killifish, gobies a
Daphnia was negligible, and concluded that su
precipitates do not harm nekton. In contrast, My
lus edulis, a sedentary filter feeder, was killed
the precipitate. Rather than being regulated by p
Zn.... was found to dissolve to a super saturat
state in seawater. (See also W71-07725 thru W7
07727) (LeGore-Washington)
W71-07724

**STUDIES ON THE TOXICITY OF HEA
METALS TO AQUATIC ANIMALS AND T
FACTORS TO DECREASE THE TOXICITY--
THE ANTAGONISTIC ACTION OF HARDNE
COMPONENTS IN WATER ON THE TOXICI
OF HEAVY METAL IONS (JAPANESE),**
Kenji Tabata.
Bulletin of Tokai Regional Fisheries Resea
Laboratory, No 58, p 215-232, May 1969. 9 fig
tab, 38 ref.

Descriptors: *Heavy metals, *Water pollution
fects, *Toxicity, Aquatic animals, Calcium, Cob
Copper, Magnesium, Fish toxins, Killifish
Daphnia, Nekton, Mortality, Water pollution tre
ment, Rainbow trout, Trout, Carp, Bioass
Laboratory tests, Ions, Ion transport.
Identifiers: *Enhancement, Cadmium, Nick
Zinc, Mercury, Ctenopharyngodon sp., Ps
dorasbora sp., Synergism, Antagonism, TLm.

The toxicity antagonism between components
water hardness and heavy metal ions were
amined. The TLm of the metals (Cu...., Zn...., N
Co.... and Cd....) increased almost 2.8 plus or mi
0.6 fold when water hardness was increased eig
fold by addition of CaCl2 and MgSO4. Hg....
Mn.... toxicity was unaffected by water hardn
Toxicity of hexavalent Cr was affected in the c
of Daphnia, but not in the case of carp as
animals. Sodium ion increased the TLm of Zn
Cu...., Cd...., Ni.... or Co...., but potassium ion
no effect. (See also W71-07724) (LeG
Washington)
W71-07725

**STUDIES ON THE TOXICITY OF HEA
METALS TO AQUATIC ANIMALS AND T
FACTORS TO DECREASE THE TOXICITY--
ON THE LOW TOXICITY OF SOME HEA
METAL COMPLEXES TO AQUATIC ANIMA
(JAPANESE),**
Katsuo Nishikawa, and Kenji Tabata.
Bulletin of Tokai Regional Fisheries Resea
Laboratory, No 58, p 233-241, May 1969. 2 fi
tab, 12 ref.

Descriptors: *Heavy metals, *Water pollution
fects, *Toxicity, Aquatic animals, Copper, Co
Fish toxins, Water pollution effects, Carp, Bi
say, Laboratory tests, Fish farming, Fish physi
gy, Competition, Ions, Ion transport.
Identifiers: *EDTA, Mercury, Nickle, Comple
agents, Antagonism, TLm.

The effects of complexing agents on toxicit
heavy metal ions to aquatic animals were
vestigated. The authors found that soc
thiosulfate and sodium citrate consider
decrease such toxicity. As the degree of
decreases agreed with the stability constant
heavy metal complexes formed, it was assumed
the decreases might be caused by the low tox
of heavy metal complexes. The acute toxicity o
heavy metal-EDTA complexes, however,
about the same without reference to the toxici
each heavy metal ion. It was felt, therefore,
toxicity might be attributable to EDTA. Carp
successfully reared in a concentration of soc
thiosulfate-complexed Cu.... corresponding to
times the TLm of the uncomplexed Cu..... (See
W71-07724) (LeGore-Washington)
W71-07726

UDIES ON THE TOXICITY OF HEAVY ETALS TO AQUATIC ANIMALS AND THE CTORS TO DECREASE THE TOXICITY--IV. THE RELATION BETWEEN THE TOXICI- OF HEAVY METALS AND THE QUALITY ENVIRONMENTAL WATER (JAPANESE),
nji Tabata.
lletin of Tokai Regional Fisheries Research oratory, No 58, p 243-253, May 1969. 2 fig, 4 , 23 ref.

scriptors: *Heavy metals, *Fish toxins, *Water lution effects, *Toxicity, *Assessments, Aquatic mals, Daphnia, Mortality, Rainbow trout, Trout, p, Bioassay, Laboratory tests, Ions, Ion trans- t, Water pollution sources, Water policy.
ntifiers: *Zinc, Pseudorasbora sp., Girella sp., n, Sweetfish.

enty-four hr TLm values of Zn.... to Daphnia in er samples from eight freshwater areas were ermined, and it was found that results could be lied to the natural situation. The fifty important rs and lakes in Japan were classified into six ups according to water hardness, and the dif- nces in toxicity of heavy metal ions among e groups was estimated. As a trial to exhibit missible concentrations of heavy metals for atic animals which agreed with the biological the environmental conditions in each water , the permissible concentrations of Zn.... TO , Pseudorasbora, rainbow trout, sweetfish, lla or Daphnia in the above fresh and sea water ups were calculated on the basis of 48 hr TLm es. (See also W71-07724) (LeGore-Washing-
-07727

E EFFECT OF TEMPERATURE ON CATA- TIC AND REGULATORY FUNCTIONS OF RUVATE KINASES OF THE RAINBOW OUT AND THE ANTARCTIC FISH TRE- TOMUS BERNACCHII,
ish Columbia Univ., Vancouver. Dept. of logy.
. Somero, and P. W. Hochachka.
hemical Journal, Vol 110, p 395-400, 1968. 5 2 tab, 36 ref.

criptors: *Fish physiology, *Rainbow trout, zymes, Water temperature, Regulation, En- nmental effects, Mode of action, Biochemistry, nal metabolism, Inhibition, *Thermal pollu- , Water pollution effects, Temperature.
tifiers: *Pyruvate kinases, *Trematomus acchii, *Enzyme activity, Antarctic fish, Km, perature dependence, ATP, ADP, sphoenol pyruvate, Fructose diphosphate.

Km value of pyruvate kinase for one of its two trates, phosphoenolpyruvate, is temperature- ndent, and is lowest at temperatures that ly coincide with the habitat temperatures of wo fishes. Two regulatory functions of pyru- kinase, feed forward activiation by fructose osphate and feedback inhibition by ATP, are erature-independent. Enzyme-ADP interac- is also temperature-independent. It is con- d that enzyme-substrate and enzyme-modula- nteractions are important factors in short-term in evolutionary adaptations by poikilotherms anges in temperature. (Sjolseth-Washington)
-07728

PLANKTON, ZOOBENTHOS, AND BOT- SEDIMENTS AS RELATED TO POLLU- N AND WATER EXCHANGE IN THE OFJORD,
Univ. (Norway). Inst. of Marine Biology.
rik Beyer.
olaender wissenschaftliche Meeresunter- ung, Vol 17, p 496-509, 1968. 7 fig, 1 tab, 28

riptors: *Water pollution effects, *Bottom ents, *Zooplankton, Benthic fauna, Dis- d oxygen, On-site investigations, Bathymetry, Hydrography, Decomposing organic matter, Water quality, On-site data collections.
Identifiers: *Oslofjord, *Oxygen shortage, *Norway, Polychaetes, Bottom coring, Water exchange, Aglantha digitale, Rathkea octopunctata.

Aglantha digitale and Rathkea octopunctata were found in greatest numbers in the most heavily polluted areas, where bottom water and sediment were generally anoxic and azoic. Spionidae, Hesionidae and Nudibranchia thrived in polluted areas when these were not anoxic. The remaining benthos components compared occurred primarily in water of better quality. A consistent and distinct ranking order was found for all these components. In areas where no bottom fauna was found, and in transitional zones, black or dark layers in the sediment indicated various degrees of oxygen insufficiency. Most remarkable differences (variations) were recorded in the successive years of the survey. (Sjolseth-Washington)
W71-07729

AN EVALUATION OF THE 1968 FISH KILL IN THE DES MOINES RIVER BELOW DES MOINES,
Iowa State Dept. of Conservation. Biology Section.
Jim Mayhew, and Gaige Wunder.
Iowa Quarterly Biology Reports, Vol 21, No 2, p 70-72, Apr, May, June 1969. 1 ref.

Descriptors: *Water pollution effects, *Dissolved oxygen, *Oily water, *Oxygen sag, *Fishkill, *Organic loading, *Iowa, Sewage effluents, Water pollution sources, Oil, Oil wastes, Oxygen, Carp, Carpsucker, Catfishes, Channel catfish, Minnows, Organic wastes, On-site investigations, Municipal wastes.
Identifiers: *Des Moines River (Iowa), Tolerance limits, TLm.

A fishkill on the Des Moines River, Iowa occurred in January, 1968, and was associated with the Des Moines Sewage Treatment Plant bypass outfall. The effluent consisted of organic material and thick, heavy oil. Dissolved oxygen downstram from the outfall was less than 2.0 mg/l, but was 10.0.. mg/l above the outfall. D.O. remained low for 35 days. Channel and flathead catfish, carp, river carpsuckers and numerous minnows were affected. Because the river had been under study previously, the authors were able to use tagging techniques to estimate that 54% of the resident channel catfish had been killed. (LeGore-Washington)
W71-07730

GLENODININE, AN ICHTHYOTOXIC SUBSTANCE PRODUCED BY A DINOFLAGELLATE, PERIDINIUM POLONICUM,
Tokyo Univ. (Japan). Lab. of Marine Biochemistry.
Yoshiro Hashimoto, Tomotoshi Okaichi, Le Dung Dang, and Tamao Noguchi.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 34, No 6, p 528-534, June 1968. 7 fig, 1 tab, 8 ref.

Descriptors: *Fishkill, *Toxins, *Algal poisoning, *Algal toxins, *Phytotoxicity, *Fish diseases, *Fish toxins, Toxicity, Hydrogen ion concentration, Dissolved oxygen, Algae, Phytoplankton, Alkaline water, Alkalinity, Fish farming, Fish food organisms, Fish physiology, Red tide, Organic compounds, Dinoflagellates.
Identifiers: *Peridinium sp., *Glenodinine, Alkaloid toxins, Ibogaalkaloid, Organic toxins.

Mass mortalities associated with phytoplankton blooms sometimes occur in Japanese fish culture operations. The authors opine that this may be the first report identifying the toxic species and its associated toxin. The offender, glenodinine, was isolated from the dinoflagellate, Peridinium polonicum. The toxin is an alkaloid showing some resemblance to ibogaalkaloid, and has the sulfhydryl function in the molecule. Fishkills occurred in the afternoon or evening when dissolved oxygen was high and pH levels of 8.7-9.2 were present. Although mortalities sometimes occurred after blooms rather than concurrently, lethal levels of glenodinine were found in the water during the mortalities. The substance is apparently toxic only in alkaline medium, created by high phytoplanktonic photosynthetic activity. (LeGore-Washington)
W71-07731

NOTES ON AN EXPERIMENT UPON THE EFFECT OF CRUDE OIL ON LIVE CORALS,
Department of Primary Industries, Brisbane (Australia).
E. M. Grant.
Fisheries Notes (New Series): No 1, Sept 1970. 3 p. (from: Fisheries Branch, Dept of Primary Industries, Brisbane, Queensland, Australia).

Descriptors: *Oil, *Oily water, *Water pollution effects, *Coral, Oil wastes, Bioassay, Water pollution, Pollutants, Reefs, Aquatic animals, Aquatic environment, Aquatic habitats, Tidal effects.
Identifiers: *Favia sp., Australia, Monnie crude oil, Crude oil, Oil spills, Prediction.

Two Turban Corals (Favia speciosa) were kept in each of three 15 gal saltwater aquaria. One tank served as a control, and three pints of Moonie crude oil were gently layered on the water surfaces of each of the remaining two tanks. Tidal fluctuations were simulated in one 'polluted' tank by gentle siphoning, permitting contact of oil on the coral for about five minutes each day. Precautions were taken to avoid turbulence. On the eighth day oil was skimmed from the surface, and the experiment was continued for an additional 16 days. No coral deaths or ill effects were noted, and the authors suggest that caution should temper predictions as to oil's effects on marine life. This study is regarded as indicative, not definitive. (LeGore-Washington)
W71-07732

EFFECTS OF DIELDRIN ON GLUTAMIC OXALOACETIC TRANSAMINASE IN POECILIA LATIPINNA,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
Charles E. Lane, and Edward D. Scura.
Journal of the Fisheries Research Board of Canada, Vol 27, No 10, p 1869-1871, 1970. 1 fig, 12 ref.
FWPCA Grant No 18050 DRL.

Descriptors: *Dieldrin, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Lethal limit, *Fish physiology, *Fish toxins, *Bioassay, Pesticides, Resistance, Fish diseases, Poisons, Toxicity, Toxins, Enzymes, Pathology, Agricultural watersheds, Gas chromatography, Laboratory tests.
Identifiers: *Poecilia sp., *Sailfin molly, Serum enzymes, Glutamic oxaloacetic transaminase.

Sailfin mollies (Poecilia latipinna) were exposed to 0.003, 0.006 and 0.012 ppm dieldrin in sea water at a flow rate of 266 ml/min. Gas chromatography was used to monitor pesticide levels. Blood samples were drawn into capillary tubes directly from the dorsal aorta, and its serum glutamic oxaloacetic transaminase (SGOT) levels were determined by the method of Karmen as modified by Henry et al. Dieldrin caused rapid and great increases in SGOT levels, apparently by inducing cell damage. Although 0.006 and 0.012 ppm killed most fish by 72 hr, final SGOT levels did not correlate with mortality. Surviving fish exposed to only 0.003 ppm accumulated the highest SGOT levels. Considerable variability in resistance to dieldrin among fish was noted. (LeGore-Washington)
W71-07733

POSSIBLE METABOLITES OF DIELDRIN IN THE SAILFIN MOLLIE (POECILIA LATIPINNA),
Miami Univ., Fla. Inst. of Marine and Atmospheric Sciences.
For primary bibliographic entry see Field 05A.
W71-07734

THE MINIMUM OXYGEN REQUIREMENTS OF FIVE SPECIES OF FISH UNDER QUIESCENT CONDITIONS,
Oklahoma State Univ., Stillwater.
Walter R. Whitworth, and William H. Irwin.
Proceedings of the 15th Annual Conference of the Southeastern Association of Game and Fish Comm, 1961, p 226-235. 2 tab, 56 ref. NIH Research Grant No RG 6873.

Descriptors: *Oxygen requirements, *Dissolved oxygen, *Fish physiology, *Fish behavior, Minnows, Shiners, Respiration, Mortality, Fishkill, Bioassay, Water pollution effects.
Identifiers: *Oxygen tension, *Survival, Tolerance, Mosquito fish, Oxygen removal, Lebistes reticulatus, Pimephales promelas, Hybognathus placitus, Notropis girardi, Gambusia affinis.

The minimum oxygen requirements of the following five species of fish were studied under quiescent conditions: Lebistes reticulatus, Gambusia affinis, Pimephales promelas, Hybognathus placitus and Notropis girardi. Nitrogen gas was bubbled through the waters in the test vessels to remove the dissolved oxygen. The fish were tested under varied temperatures and at different levels of oxygen depletion. All specimens tested were able to live at oxygen tensions of 1.0 ppm. The reactions of the fish vary with (1) the spread of oxygen removal, and (2) the species. (Sjolseth-Washington)
W71-07735

STUDIES OF PRIMARY PRODUCTIVITY IN COASTAL WATERS OF SOUTHERN LONG ISLAND, NEW YORK,
Dow Chemical Co., Freeport, Tex; and Puerto Rico Univ., Mayguez. Dept. of Marine Sciences; and Town of Hempstead, N.Y. Dept. of Conservation and Waterways; and Virgin Islands Coll., St. Thomas.
For primary bibliographic entry see Field 02L.
W71-07875

HIGH MOLECULAR WEIGHT ALGAL SUBSTANCES IN THE SEA,
Naval Undersea Research and Development Center, Pasadena, Calif.
For primary bibliographic entry see Field 02L.
W71-07878

THE INTERACTIONS OF Cu.... AND CN- WITH PARAQUAT PHYTOTOXICITY TO A CHLORELLA,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
Sue-Fei Tsay, Jhy-Mei Lee, and J. Q. Lynd.
Weed Science, Vol 18, No 5, p 596-598, 1970. 2 fig, 1 tab, 9 ref.

Descriptors: *Paraquat, *Chlorella, *Phytotoxicity, Herbicides, Copper, Aquatic plants, Test procedures, Toxicity, Chlorophyll, Metabolism, Pesticides.
Identifiers: *Cyanide, *Copper-cyanide interactions.

Cultures of Chlorella pyrenoidosa, IAC 251, were grown in inorganic salt media to near the peak of the log phase of growth and then treated with copper sulfate. Following centrifuging and adjustment of cell density, synchronized cultures were subjected to factorial studies of copper, cyanide, and Paraquat herbicide interaction. The toxicity of the compound to algae resulting from the interaction of copper, cyanide, and 1,1'-dimethyl-4,4'-bipyridinium ion of the herbicide was determined by measuring absorbance of chlorophyll at 434 and 670 millimicrons. Copper inhibited phytotoxicity whereas cyanide accelerated activity of the Paraquat with antagonistic interactions between copper (2 ppm) and cyanide (16 ppm) at Paraquat level of 2 ppm. (Wilde-Wisconsin)
W71-07881

ON RESEARCH OF HUMIC SUBSTANCES IN ESTONIAN LAKES (IN GERMAN),
Akademiya Nauk Estonskoi SSR, Tartu. Inst. of Zoology and Botany.
H. Simm.
English summary. Archiv fur Hydrobiologie, Vol 66, No 3, p 273-282, 1969. 2 fig, 1 tab, 9 ref.

Descriptors: *Eutrophication, *Lakes, *Organic matter, *Humus, Bogs, Humic acids, Forest soils, Color, Marshes, Fulvic acids, Oxygen.
Identifiers: *Estonia (SSR), Humic lakes, Potassium dichromate, Permanganate oxidation.

Water of more than 40% of numerous lakes of Estonian Republic exhibits potassium dichromate consumption over 35 mg/l of oxygen. The high content of organic matter is imparted by drainage areas dotted with muskegs, fens, marshes, and lowland forests. A transition from oligorganic to euorganic waters is marked by an increase in the content of colloidal substances and the intensity of water color. Water of lakes influenced by marshy watersheds is enriched in fulvic acid; lakes located in the proximity of raised bogs have a higher content of humic acid. Enclosed table provides data of seasonal changes in oxidation capacity and color of lakes belonging to different levels of organo-eutrophication. (Wilde-Wisconsin)
W71-07883

VIRUS OCCURRENCE IN RAW SEWAGE SLUDGE AND EFFLUENT OF A BIOLOGICAL CLARIFICATION PLANT (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene.
S. Carlson.
English abstract. Zentralblatt fur Bakteriologie, Parasitenkunde, Infektion, und Hygiene, Vol 212, No 1, p 50-60, 1969.

Descriptors: *Viruses, *Sewage sludge, *Epidemiology, Public health, Diseases, Water pollution sources, Effluents, Biological treatment, Enteric bacteria, Waste water treatment.
Identifiers: *Entero viruses, *Poliovirus, Berlin (Germany).

The presence of enteroviruses was detected in a volume of raw sewage as small as 0.1 ml in summer and 0.5 ml in winter. Adolescents during the summer appeared to be the maximum of causative agents. A relationship was indicated between outbreaks of epidemics and the virus density in the sewage. Purification of sewage in Imhoff tanks, percolating filters, and secondary sedimentary tanks eliminated only a small percentage of viruses. Tests conducted in an assembly of an oxidation ditch, secondary sedimentation tank, and a tower type percolating filter indicated reduction by approximately one decimal the density of attenuated type I poliovirus. Sewage discharged into water used for drinking or swimming should be subjected to disinfection during the warmer portion of the year. (Wilde-Wisconsin)
W71-07884

THERMOSTABILITY OF LITTORINA MOLLUSKS AS RELATED TO ENVIRONMENTAL CONDITIONS OF DIFFERENT SPECIES (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Institut Biologii.
A. D. Konev.
Zhurnal Obshchei Biologii, Vol 31, No 3, p 337-341, 1970. 4 fig, 2 tab, 7 ref.

Descriptors: *Mollusks, *Temperature, *Mortality, Resistance, Salinity.
Identifiers: *Thermostability, *Littorina, Amur Bay, Sea of Japan.

Test organisms, including Littorina brevicula, L mandshurica, and L kurila, were subjected to different levels of temperature for ten minutes or longer periods. 50% population mortality was accepted as the criterion of thermostability. The recording of mortality was extended to 15 days following the transfer of the test mollusks into water of 22C and 2.9% salinity. The critical temperature for L mandshurica was 43C and for L brevicula - 46C. The maximum aplitude of thermostability was exhibited by eurybionic species possessing high degree of salinity tolerance. (Wilde-Wisconsin)
W71-07888

RELATION OF THE PHYTOPLANKTON TO TURBULENCE AND NUTRIENT RENEWAL IN CASCO BAY, MAINE,
Woods Hole Oceanographic Institution, Mass.
Edward M. Hulburt, and Nathaniel Corwin.
Journal Fisheries Research Board of Canada, Vo 27, No 11, p 2081-2090, 1970. 4 fig, 4 tab, 30 ref.

Descriptors: *Phytoplankton, *Turbulence *Nutrients, *Distribution, Maine, Diatoms Nitrates, Temperature, Light, Phosphates, Sea water, Bays, Inflow, Currents (Water), Tempora distribution, Spatial distribution.
Identifiers: *Casco Bay (Maine), Thalassiosira nor denskioldii, Chaetoceros socialis, Chaetoceros de bilis, Skeletonema costatum, Leptocylindru minimus, Rhizosolenia delicatula, Guinardia flac cida.

Distributions of phytoplankton and nutrients i Casco Bay (Maine) evidenced by abundance o diatoms from late winter to end of summer, are af fected by the bay's hydrographic features. Nutrien content of the water, particularly nitrate, i depleted during spring by the algal populations ex cept in deep water at bay's entrances. Here ap preciable quantities of nitrate persist into mi summer. Influxes of deep water may carry them in ward and mix them upward, although the chang from spring diatoms, Thalassiosira an Chaetoceros, to Skeletonema is considered to de pend on temperature and light change Phytoplankton extended downward to 30 meters i the bay entrances, but its in situ growth wa restricted to depths closer to the surface due to th turbidity. Its abundance must depend in ear spring on the quantity of nutrients present an renewed from deep water. Both phosphate an nitrate concentrations decreased in surface wate during spring. The continued abundance Skeletonema costatum through summer shows th distinctive effect that enhanced turbulence an concomitant nutrient renewal may have on th flora. This seasonal diatom abundance is importa to filter-feeding animals, for mussles and clam occur between islands. (Jones-Wisconsin)
W71-07889

ECOLOGY, COMPETITION, AND COENOLOGY OF REED (PHRAGMITES COMMUNIS AND THE TAXONOMY OF PHRAGMITETE (IN GERMAN),
Eotvos Lorand Univ., Budapest (Hungary Botanijus Kertje.
A. Borhidi.
English summary. Acta Botanica Academiae Scie tiarum Hungaricae, Vol 16, No 1-2, p 1-12, 1970 fig, 1 tab, 35 ref.

Descriptors: *Aquatic plants, *Plant ecolo *Aerobic conditions, *Alkaline water, Aqua habitats, Cattails, Competition, Environmental e fects, Limiting factors, Brackish water, Marsh Ecological distribution.
Identifiers: *Reeds, *Phragmites commun *Typha angustifolia, Glyceria maxima.

Ecological amplitude and coenological niche of t common reed, Phragmites communis were studi The distribution of this plant is delineated osmotic pressure of water and activity of anaero processes expressed by oxygen consumption. T intensity of anaerobic processes also decides outcome of competition between Phragmites a cattails, Typha angustifolia, the latter being mo tolerant of stagnant conditions. As the coenologi role of the reed exceeds the framework Phragmitetea (Brackrohrichte), a suggestion

de to distinguish reeds growing in alkaline and
ckish waters. (Wilde-Wisconsin)
1-07893

OSPHORUS IN WATER AND WASTE
TER-AN ANNOTATED SELECTED
BLIOGRAPHY,
th Carolina Univ., Chapel Hill. Waste water
earch Center.
primary bibliographic entry see Field 05B.
1-07894

RODAN FOR CLEANING OILED SEABIRDS,
eborg Univ. (Sweden). Inst. of Medical
chemistry; and Goteborg Univ. (Sweden). Inst.
hysiological Botany.
e Larsson, and Goran Odham.
ine Pollution Bulletin, Vol 1 (NS), No 8, p 122-
, Aug 1970. 1 fig, 2 tab.

criptors: *Birds, *Waterfowl, *Detergents,
, *Oily water, *Emulsifiers, *Rehabilitation,
er pollution effects, Water pollution treatment,
lard duck, Geese (Wild), Shore birds, Wading
s, Water birds, Cleaning, Treatment, Gas chro-
ography, Biochemistry, Chemical properties,
bition, Toxins, Toxicity, Poisons, Swans.
tifiers: *Seabirds, *Feather wax, *Preening
, *Larodan, Anas sp., Wax.

preen gland wax of several seabirds is com-
d of monoesters of methylated long-chain fatty
hols and fatty acids, but the combinations are
rently species-specific. Complex combinations
mponents are found, e.g. the wax of the com-
mallard (Anas platyrhynchos) may contain up
50 different compounds. Oil impairs water
llancy and heat insulation properties of the
age, and impairs flying and feeding ability. De-
nts remove feather wax, and no seabird can be
ned to its natural environment until waxes are
aced. Larodan 127, a lipid-containing cleaning
t, was used to remove Shell talpa oil 30 from
s. After 8-10 days, swimming ability was
ored, which compares favorably with other
ning agents. (LeGore-Washington)
-07896

-LETHAL EFFECTS ON LIVING ORGAN-
S,
sh Museum of Natural History, London (En-
d).
vid George.
ne Pollution Bulletin, Vol 1 (NS), No 7, p 107-
July 1970. 22 ref.

riptors: *Water pollution effects, *Water pol-
n treatment, *Oily water, *Metals, *Pesticides,
assay, *Annelids, *Detergents, *Emulsifiers,
Aldrin, DDT, Dieldrin, Organophosphorous
cides, Carbamate pesticides, Food chains,
y metals, Solvents, Carriers, Organic com-
ds, Pesticide residues, Toxicity, Toxins,
ns, Worms.
ifiers: *Polychaetes, *Organic solvents, BP
, Essolvene, Corexit 7664, Biomagnification,
, Silver, Zinc, Mercury, Cirratulus sp., Cir-
nia sp., Fawley Southampton, Kerosene.

ub-lethal effects are generally reviewed of oil,
spersants, pesticides and metals on the marine
shore environment. Original research with
polychaetes, Cirratulus cirratus and Cirriformentaculata, is also described. Fuel oil spilled at
ey, Southampton, England apparently had no
t on mortality or spawning of these
haetes. Worm populations were affected,
ver, by Essolvene, which was used to clean in-
tions in the area. Laboratory experiments
mined that worms never recovered from high
thal doses of BP 1002 and Essolvene, but that
could withstand 100,000 ppm of water soluble
xit 7664. (LeGore-Washington)
-07897

SOME SUB-LETHAL EFFECTS OF BP 1002 UPON MARINE GASTROPOD MOLLUSCS,
University of Strathclyde, Glasgow (Scotland). Dept. of Biology.
E. J. Perkins.
Journal of the Devon Trust, No 19, p 794-798, Dec 1968. 3 tab, 3 ref.

Descriptors: *Bioassay, *Lethal limit, *Toxicity, *Emulsifiers, *Water pollution effects, *Water pollution treatment, *Growth rates, *Detergents, Toxins, Resistance, Poisons, Gastropods, Mollusks, Snails, Oil, Oil wastes, Oily water, Water pollution sources, Mortality, Pollutants, Treatment, Surfactants.
Identifiers: *PB 1002, *Oil spills, *Oil spill treatment, *Growth inhibition, *Torrey Canyon, TLm, Littorina sp., Nucella sp., Buccinum sp., Concentrations, Dose, Tarsolvent (Petrofina).

PB 1002 is an oil emulsifier, and was used to disperse the Torrey Canyon oil spill in 1967. Short-term TLm values for several organisms against BP 1002 were subsequently determined, but these yield inadequate information. The long-term mortality of animals exposed to BP 1002 and returned to their environment was studied with several gastropods, principally Littorina littorea, L. saxatilis and Nucella lapillus. Mortality was induced by exposure to concentrations considerably lower than the previously determined 24 hr LC50. Growth inhibition of L. littorea was noted at 7.5 ppm, which is 1/400 the 24 hr LC50. Growth inhibition may be indefinitely detected as a result of a single exposure to a pollutant, and such inhibition may require reformation of the definitions of pollution. (LeGore-Washington)
W71-07898

THE EFFECTS OF VARYING CONCENTRATIONS OF NUTRIENTS, CHLORINITY, AND DISSOLVED OXYGEN ON POLYCHAETOUS ANNELIDS,
California State Coll., Long Beach. Dept. of Biology.
Donald J. Reish.
Water Research, Vol 4, p 721-735, 1970. 13 tab, 13 ref.

Descriptors: *Bioassay, *Pollutant identification, *Water pollution effects, *Toxicity, *Environmental sanitation, *Sewage effluents, *Lethal limit, *Annelids, *Bioindicators, Phosphates, Nitrates, Silicates, Chlorine, Dissolved oxygen, Impaired water quality, Pollutants, Water pollution, Indicators, Investigations, Water pollution sources, Toxins, Aquatic environment, Disposal, Treatment facilities, Wastes, Chemical wastes, Inorganic compounds, Fertilizers.
Identifiers: *Polychaetes, Concentrations, TLm, Nereis sp., Neanthes sp., Dorvillea sp., Capitella sp.

The effects of varying concentrations of known environmental variables around marine domestic sewer outfalls were studied on four species of polychaetous annelids which have been employed as indicators of varying degress of marine pollution (Nereis grubei, Neanthes arenaceodentata, Dorvillea articulata and Capitella capitata). The variables included increased concentrations of nitrates, phosphates and silicates, and decreased concentrations of chlorinity and dissolved oxygen. These factors were measured individually, the 3 nutrients together, and all 5 variables together. Data were expressed in the form of 28 day TLm values. N. grubei, the healthy zone indicator, was the most sensitive sp. studied. In general, the tolerances of the two semi-healthy zone indicators and the polluted zone indicator were similar. Comparisons of the TLm values with the concentrations of these factors present at the bubble of the Orange County, California outfall showed that these four species would be unaffected directly by the altered conditions in the waste discharge. (LeGore-Washington)
W71-07899

SPAWNING OF THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA, AT EXTREME PH LEVELS,
Bureau of Commercial Fisheries, Milford, Conn. Biological Lab.
Anthony Calabrese, and Harry C. Davis.
The Veliger, Vol 11, No 3, p 235-237, 1968. 1 fig, 1 tab, 8 ref.

Descriptors: *Oysters, *Hydrogen ion concentration, *Spawning, Aquatic animals, Benthos, Commercial shellfish, Mollusks, Acidity, Alkalinity, Larvae, Bioassay, Laboratory tests, Gametocides, Viability, Connecticut.
Identifiers: *Crassostrea virginica, American oyster, Gametes, Milford (Conn).

Oysters were induced to spawn at various pH levels by use of techniques developed at the Milford laboratory. Successful spawning occurred at pH 6.0 to 10.0. After exposure to test pH levels for varying periods, experimental gametes were mixed with gametes from oysters spawned at normal pH (approximately 7.8). At pH 6.0 and 10.0, gametes lose their viability after 2-4 hr. The viability of oyster gametes spawned at normal pH levels also decreases over time, but the decrease is more abrupt at the extreme pH levels of 6.0 and 10.0. (LeGore-Washington)
W71-07900

STUDIES ON THE TOXICITY OF HEAVY METALS TO AQUATIC ANIMALS AND THE FACTORS TO DECREASE THE TOXICITY--V. A TRIAL TO DECREASE THE TOXICITY OF HEAVY METAL IONS BY THE ADDITION OF COMPLEXING AGENTS (IN JAPANESE),
Universidad Autonoma del Estado de Baja, California (Mexicali).
Kenji Tabata, and Katsuo Nishikawa.
English abstract. Bulletin of Tokai Regional Fisheries Research Laboratory, No 58, p 255-264, May 1969. 1 fig, 4 tab, 10 ref.

Descriptors: *Heavy metals, *Water pollution treatment, *Copper, *Waste treatment, *Sewage treatment, *Chemical precipitation, Toxicity, Water pollution control, Mollusks, Oysters, Bioassay, Ions, Ion transport, Competition, Sodium compounds, Waste disposal, Mining engineering, Chemical wastes, Industrial wastes.
Identifiers: *Mercury, *EDTA, *Complexing agents, Metals, Cations, Precipitates, Green oysters, Sodium citrate, Sodium thiosulfate.

The potential use was studied of complexing agents to decrease toxicity of industrial wastes. They found a remarkable decrease in toxicity when sodium citrate or EDTA was added to copper mine wastes, and when sodium thiosulfate was added to a mercury pesticide. Cu-EDTA is more stable to bacterial decomposition than Cu-citrate. Also, Cu-citrate and Cu-thiosulfate are more readily concentrated by aquatic animals than is Cu-EDTA. This method might be useful as an adjunct to secondary treatment of wastes containing small quantities of toxic heavy metals, but that EDTA is probably too expensive. Such treatment, might be effective in prevention of 'green' oysters. (LeGore-Washington)
W71-07901

STUDIES ON 2-PIPERIDINO-8-MERCAPTOADENINE, A POTENT INHIBITOR OF CLEAVAGE IN ECHINODERM EMBRYOS,
Sloan-Kettering Inst. for Cancer Research, New York; and Mount Desert Island Biological Lab., Salisbury Cove, Me.
C. W. Young, F. J. Hendler, E. Simmel, and D. A. Karnofsky.
Experimental Cell Research, Vol 60, p 45-53, 1970. 4 fig, 4 tab, 10 ref.

Descriptors: *Inhibition, *Inhibitors, *Metabolism, Biochemistry, Chemcontrol, Enzymes, Retardants, Eggs, Embryonic growth stage, Incubation, Competition, Pathology, Fertility, Resistance.

Identifiers: *Cleavage, *Echinoderms, *Mercaptoadenine derivatives, Sand dollar, Development, DNA, PMA, Karyokinesis.

Several 8-mercaptoadenine derivatives inhibited pronuclear fusion, karyokinesis and cleavage in the sand dollar embryo. The most potent of these 2-piperidino-8-mercaptoadenine (PMA) prevented cleavage when present at a concentration of 0.1 ug/ml or greater. At cleavage-inhibitory concentrations, PMA did not inhibit synthesis of protein; drug effects upon synthesis of DNA seemed to be secondary to changes in karyokinesis. The microscopic and biochemical effects of PMA closely resembled those of colchicine; they differed significantly from the effects produced by dinitrophenol, usnic acid, cyclohexamide, beta-mercaptoethanol and dithiothreitol. Both 6-NH2 and 8-SH substitutions on the purine molecule were necessary for cleavage inhibitory potency. Marginal protection against cleavage inhibition was afforded by mercaptopurines, mercaptopurine ribosides and cysteine, but not by purines, purine ribosides, methylmercaptopurine or cystine. (LeGore-Washington)
W71-07902

SOME EFFECTS OF DETERGENTS IN THE MARINE ENVIRONMENT,
University of Strathclyde, Glasgow (Scotland). Dept. of Biology.
E. J. Perkins.
Chemistry and Industry, p 14-22, 3 Jan 1970. 5 fig, 10 tab, 4 ref.

Descriptors: *Bioassay, *Lethal limit, *Toxicity, *Emulsifiers, *Water pollution effects, *Water pollution treatment, *Growth rates, *Detergents, Toxins, Aromatic compounds, Resistance, Poisons, Gastropods, Mollusks, Snails, Oil, Oil wastes, Oily water, Water pollution sources, Mortality, Pollutants, Treatment, Surfactants.
Identifiers: *BP 1002, *Oil spills, *Oil spill treatment, *Growth inhibition, *Torrey Canyon, *Tarsolvent (Petrofina), *Slickgone (Dasic), Littorina sp., TLm, Nucella sp., Buccinum sp., Concentrations, Dose.

This study concerned the physiological consequences of apparently sub-lethal concentrations of detergents. Three species of gastropods (Littorina spp. and Nucella sp.) were exposed to severe and to graded concentrations of various detergents (BP 1002, octyl phenol ethoxylate surfactant (DS 4359), Dasic 'Slickgone,' or Petrofina 'Tarsolvent'), and were returned to a natural environment. In all cases, considerable delay was required for full development of the mortality pattern. Seven day interpretations of effects were found inadequate, and effects were still evident as long as 22 weeks post-exposure. Both mortality and growth inhibition may be significant at very low concentrations, while inactivation may have more effect on survival than do TLm concentrations. (LeGore-Washington)
W71-07903

ORGANOCHLORINE INSECTICIDE RESIDUES IN FISH (NATIONAL PESTICIDE MONITORING PROGRAM),
Bureau of Sport Fisheries and Wildlife, Fort Collins; and Bureau of Sport Fisheries and Wildlife, Washington, D.C.
Croswell Henderson, Wendell L. Johnson, and Anthony Inglis.
Pesticides Monitoring Journal, Vol 3, No 3, p 145-171, Dec 1969. 1 fig, 4 tab, 23 ref.

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, *Monitoring, *Water pollution effects, Pesticides, Residues, Bioassay, Fish physiology, Pollutants, DDT, Dieldrin, Aldrin, Endrin, Heptachlor, Agricultural chemicals, Food chains, Pesticide drift, Public health, Chromatography, Analytical techniques, Chemical analysis, Data collections, Fish diseases.
Identifiers: DDE, TDE, Lindane, Heptachlor epoxide, Chlordane, Toxaphene, Column chromatography.

As a part of the National Pesticide Monitoring Program, fish were collected from 50 sampling stations located in the Great Lakes and in major river basins throughout the United States. Three composite samples, consisting of 5 adult fish of each of 3 species, were collected at all stations during the spring and fall of 1967 and 1968. The samples were analyzed for residues of 11 organochlorine insecticides. DDT and/or metabolites were found in 584 of the 590 composite samples, with values ranging to 45 ppm (mg/kg wet weight, whole fish). Dieldrin was found in 75% of the samples, with values ranging upward to nearly 2 ppm. Other organochlorine insecticide residues were found in fewer samples, but some had fairly high residue levels. Relatively high residues of DDT and metabolites, dieldrin, heptachlor, heptachlor epoxide, and chlordane were found consistently during all sampling periods at some stations. (LeGore-Washington)
W71-07904

HISTOPATHOLOGICAL EFFECTS OF THE INSECTICIDES, HEPTACHLOR AND NICOTINE, ON THE GILLS OF THE CATFISH, HETEROPNEUSTES FOSSILIS,
Kalyani Agricultural Univ. (India). Dept. of Zoology.
Sushil Kanta Konar.
Japanese Journal of Ichthyology, Vol 15, No 4, p 156-159, 1969. 1 fig, 6 ref.

Descriptors: *Heptachlor, *Animal pathology, *Respiration, Fish physiology, Catfish, Fish behavior, Fish toxins, Fishkill, Toxicity, Pesticide toxicity, Water pollution effects, Insecticides.
Identifiers: *Nicotine, *Histopathological effects, *Fish gills, Mucus, Respiratory distress, Heteropneustes fossilis.

The fishes exposed to 1.0 ppm of heptachlor and 3.2 ppm of nicotine at room temperature (18.89-23.89C) died within 19 to 44 hours. The fishes exhibited acute respiratory distress with both insecticides. The gills of fishes exposed to heptachlor were found coated with a layer of mucus, but no such covering was found on the gills of those which died in nicotine. The surface cells of the gill filaments of fishes killed by heptachlor showed disintegration, rupture, vacuolation, karyorrhexis, and extrusion and degeneration of nuclei and cytoplasm. The number of mucous cells in these gills was increased which resulted in the secretion of mucus over them. With nicotine, only the basal parts of a few gill filaments were damaged. Injury with heptachlor was due to surface irritation rather than absorption of the poison through the gills. Due to paralytic action induced by nicotine, the fishes failed to renew water of their opercular chamber which resulted in asphyxiation and finally death. (Sjolseth-Washington)
W71-07905

PESTICIDES IN THE ANTARCTIC,
Pennsylvania State Univ., University Park.
J. L. George, and D. E. H. Frear.
Journal of Applied Ecology, 3 (suppl), p 155-167, June 1966. 3 ref, 6 tab.

Descriptors: *DDT, *Pesticides residues, *Antarctic, Antarctic Ocean, Gas chromatography, Snow, On-site data collections, Pesticide drift.
Identifiers: *Weddell Seals, *Penguins, Tissue analyses, Skua, Trematomus bernacchi, Rhigophila dearboni, DDE.

The Antarctic was investigated for the presence of pesticides. Samples of snow soils, fauna and flora were collected. Measurements able to detect 0.0005 ppm in water, 0.005 ppm in animal tissues, detected no residues in fifteen snow samples nor in seven samples of invertebrates from four phyla. Residues were found in vertebrates: only in one of eight samples of three fish species and none in one Emperor Penguin, but four of sixteen Adelie Penguin, four of sixteen Weddell Seals and fifteen o sixteen Skuas contained residues in one or more tis sues. Maximum residues in ppm wet weight were 0.44 DDT in the fish Rhigophila, 0.18 DDT i Adelie Penguins, 0.15 DDT in Weddell Seals, an 2.8 DDE in Skuas. Pesticides, therefore, occur i the Antarctic, thousands of kilometers from th nearest point of use. The residues are much highe in the fatty issues of vertebrate predators than i the general environment. (Sjolseth-Washington)
W71-07906

MORTALITY AT SOUTHEND,
British Museum of Natural History, London (En gland).
J. David George.
Marine Pollution Bulletin, Vol 1 (NS), No 9, Sep 1970. 1 p.

Descriptors: *Oil, *Oily water, *Detergent *Emulsifiers, *Water pollution effects, Mussel Shellfish, Annelids, Snails, Gastropods, Mollusk Crabs, Water pollution treatment, On-site i vestigations, Evaluation, Pollution (Water), Mo tality, Pollutants, Toxins, Poisons, Mud flats.
Identifiers: *BP 1002, *BP 1100, *Polychaete *Oil spills, Mytilus edulis, Ulva sp., Enteromorph sp., Fucus sp., Balanus sp., Littorina sp., Carcin sp., Arenicola sp., Neanthes sp., Nerine sp Nephtys sp., Cockles.

On July 27, 1970 a pipeline at Mobil's Coryto refinery in the Thames Estuary was fractured, a 400,000 kg of oil was released into the sea. Dispe sant spray and a dispersant/freshwater mixtu were used for cleaning operations. Extensive mo talities of several species of polychactes, snails, species of cockle, mussels and crabs occurred intertidal muddy sand flats within 100 m of t shore. Seaweeds on the seawall were damaged the dispersants, but the extent of damage is u clear. Mortality may have been abetted, or ev caused, by the large quantities of freshwater us to flush oil-affected areas. (LeGore-Washington)
W71-07907

OIL POLLUTION. DAMAGE OBSERVED TROPICAL COMMUNITIES ALONG THE A LANTIC SEABOARD OF PANAMA,
Smithsonian Institution, Washington, D.C. Dept. Invertebrate Zool; and Bermuda Biological Statio St. George's West.
Klaus Ruetzler, and Wolfgang Sterrer.
Bioscience, Vol 20, No 4, p 222-224, Feb 15, 197 8 fig, 1 tab, 4 ref.

Descriptors: *Oil, *Oily water, *Water pollut effects, *Pollution (Water), *Biological commu ties, Coral, Mangrove swamps, Intertidal are Beaches, Estuaries, Mud flats, Mussels, Shellfi Oysters, Snails, On-site investigations, Evaluati Mortality, Pollutants, Turtles, Fucis, Gastropods Identifiers: *Oil spills, *Bunker oil, *Diesel Crassostrea sp., Rocky shores, Galeta Island, Ca Zone, Witwater, Caretta sp., Uca sp.

A brief survey was made of the effects of 20,0 barrels of diesel oil and Bunker C spilled offsh of Galeta Island, Canal Zone, when the tanker W water was wrecked in late 1968. Rocky shor coral reefs, sandy beaches and mangrove ar were observed. Intertidal communities were m severely affected. This was particularly true of mangrove areas, where intertidal algal and seder ry faunal communities were virtually destroy Species having to penetrate the air-water interfa such as turtles, were severely affected. The m groves themselves were damaged, and the fidu crab populations were decimated. Sandy sh meiofaunal populations were dramatically reduc and rocky shore fauna was damaged. Subtidal co was not obviously affected. Detergents were used to clean the spill. (LeGore-Washington)
W71-07908

SPILL IN TARUT BAY, SAUDI ARABIA,
ne Biological Association of the United King-
Plymouth (England). Lab.
Spooner.
ne Pollution Bulletin, Vol 1 (NS), No 11, p
67, Nov 1970. 1 fig.

riptors: *Oil, *Oily water, *Pollution (Water),
er pollution effects, Coral, Mangrove
ps, Intertidal areas, Mud flats, Shellfish, Mol-
Snails, Gastropods, On-site investigations,
ation, Resistance, Pollutants, Birds, Coastal
es, Marshes, Marsh plants, Crabs, Worms,
lids, Fishkill, Shrimp.
fiers: *Oil spills, *Chronic pollution, Corexit
Arabian crude oil, Saudi Arabia, Cor-
nts, Limpets, Penaeid shrimp.

iological effects were observed of a pipeline
re in Tarut Bay, Saudi Arabia. Arabian crude
00,000 barrels), with an API gravity of 34.6
w in aromatics, was lost, and Corexit 7664
ed to disperse oil slicks. Most crabs, bivalves,
limpets and several fish were killed, but some
pods (Cerithium sp.) and tube worms
d unaffected. Shoals of healthy 2-5 cm fish
seen. Mangrove trees were largely coated
il, but three months later were recovering.
ppearance after 3 months was a good deal
than expected. Mention is made of chronic
lution in the area. Bird life does not appear to
erely damaged. (LeGore-Washington)
07909

JENCES OF STRIP MINING ON THE
OLOGIC ENVIRONMENT OF PARTS OF
ER CREEK BASIN, KENTUCKY, 1955-66,
gical Survey, Washington, D.C.
Collier, R. J. Pickering, and J. J. Musser.
ale by Superintendent of Documents, US
nment Printing Office, Washington, DC,
, Price $1.50. Geological Survey Professional
427-C, 1970. 80 p, 37 fig, 41 tab, 17 ref.

ptors: *Strip mines, *Water pollution
s, *Water pollution effects, *Hydrogeology,
ucky, Rainfall-runoff relationships, Erosion,
entation, Sediment yield, Aquatic life, Acid
vater, Sulfates, Hydrogen ion concentration.
iers: *Beaver Creek Basin (Ky).

nining of coal in the Beaver Creek basin in
central Kentucky has significantly increased
cidity and mineralization of surface and
lwater and increased the sediment content of
s in the mined area. These effects, in turn,
reduced or eliminated aquatic life in the
s. Influences of mining on the hydrologic en-
ment are limited largely to the Cane Branch
nd to Hughes Fork downstream from Cane
n. Beaver Creek, 3 miles downstream from
ined area, is relatively unaffected. An ex-
ion of the hydrologic data for a progressive
e in runoff characteristics of Cane Branch
uld be related to the history of mining in the
failed to indicate any such change. There
een no significant changes in the occurrence
ovement of groundwater in bedrock and
n the vicinity of the southwest spoil bank
bservations began in 1958. (See also W71-
thru W71-07943) (Knapp-USGS)
7935

IPITATION AND RUNOFF,
gical Survey, Washington, D.C.
IcCabe.
luences of Strip Mining on the Hydrologic
nment of Parts of Beaver Creek Basin, Ken-
1955-66, Geological Survey Professional
427-C, p C5-C9, 1970. 5 p, 4 fig, 1 tab.

ptors: *Strip mines, *Acid mine water,
all-runoff relationships, *Kentucky, *Water
on sources, Coal mines, Runoff, Data collec-
Hydrologic data, Rain gages, Stream gages,
ine wastes, Path of pollutants.
iers: *Beaver Creek Basin (Ky).

The runoff characteristics of Cane Branch and Helton Branch basins of Kentucky were studied to relate any observed differences between the two basins to differences in their exposure to strip mining. The drainage basin of Cane Branch includes strip-mined areas, whereas the drainage basin of Helton Branch has not been disturbed by strip mining. There were measurable differences in runoff characteristics between the two basins, despite the fact that similar percentages of annual precipitation go to runoff and evapotranspiration in each basin. Application of both flow-duration and annual-flood methods to analysis of stream hydrographs indicated that Cane Branch has greater peak flows per square mile of drainage area and more rapid changes in discharge, but Helton Branch has greater base flows. However, an examination of the hydrologic data for progressive change in runoff characteristics of Cane Branch that could be related to the history of mining in the area failed to indicate any such change. (See also W71-07935) (Knapp-USGS)
W71-07936

GROUNDWATER,
Geological Survey, Washington, D.C.
H. T. Hopkins, and D. S. Mull.
In: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky, 1955-66, Geological Survey Professional Paper 427-C, p C9-C14, 1970. 6 p, 4 fig.

Descriptors: *Strip mines, *Strip mine wastes, *Hydrogeology, *Groundwater movement, Water levels, Data collections, Hydrologic data, Aquifers, Recharge, Water pollution sources, Path of pollutants, Kentucky.
Identifiers: *Beaver Creek Basin (Ky).

The effects of mining on the occurrence, movement, and quality of groundwater were studied in the Cane Branch study area, Kentucky. Groundwater in the essentially unmined West Fork Cane Branch study area was also investigated to provide a basis for comparison. There has been no significant change in the occurrence and movement of groundwater in the vicinity of the southwest spoil bank since beginning of observations in the spring of 1958. Shallow groundwater in bedrock is recharged by precipitation and moves from topographically high areas to streams. Groundwater in the southwest spoil bank is recharged by direct infiltration of precipitation and seepage from adjacent pools, and it discharges mostly eastward into tributaries drainage the spoil bank area. Fluctuations of the water table in the spoil bank are largely controlled by direct infiltration of precipitation during the winter-spring season, but they are strongly influenced by seepage from pools adjacent to the spoil bank during the summer-autumn season. The shape and slope of the water table in the spoil bank have not changed significantly since observations began in 1958. (See also W71-07935) (Knapp-USGS)
W71-07937

GEOCHEMISTRY OF WATER,
Geological Survey, Washington, D.C.
J. J. Musser, and R. J. Pickering.
In: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky, 1955-66, Geological Survey Professional Paper 427-C, p C14-C30, 1970. 17 p, 9 fig, 7 tab.

Descriptors: *Strip mines, *Acid mine water, *Water pollution effects, *Water quality, *Path of pollutants, Surface waters, Streamflow, Water pollution sources, Hydrogeology, Sulfates, Geochemistry, Leaching, Erosion, Kentucky.
Identifiers: *Beaver Creek Basin (Ky).

One of the environmental factors most obviously influenced by strip mining in the Cane Branch basin of Kentucky is the chemical composition of the water. Cane Branch is an acid stream because of strip mining. This report describes and evaluates (1) changes in the chemical composition of water in the Cane Branch study area, (2) the chemical composition of water in nearby study areas unaffected by mining, and (3) the general persistence of acid water downstream from the Cane Branch mining area. Although fluctuations of annual mean concentrations due to climatic variations have made it difficult to identify a definite trend during the period 1962-66, apparently there was little change in the rate of chemical weathering or in the chemical composition of the water in Cane Branch during the last 5 years of the study. As the acid mine drainage from the Cane Branch area moves downstream, it is diluted and neutralized by inflow from streams containing bicarbonate alkalinity. The effects of the mine drainage are almost undetectable at the point where water from Little Hurricane Fork enters Beaver Creek, and Beaver Creek below this point has a slightly acid pH like that of neighboring streams unaffected by acid mine drainage. (See also W71-07935) (Knapp-USGS)
W71-07938

EROSION AND SEDIMENTATION,
Geological Survey, Washington, D.C.
C. R. Collier.
In: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky, 1955-66, Geological Survey Professional Paper 427-C, p C31-C46, 1970. 16 p, 12 fig, 1 tab.

Descriptors: *Strip mines, *Strip mine wastes, *Erosion, *Sedimentation, *Sediment yield, Provenance, Vegetation effects, Gully erosion, Sheet erosion, Stream erosion, Kentucky.
Identifiers: *Beaver Creek Basin (Ky).

The sediment characteristics of Cane Branch, Kentucky, were greatly affected by strip mining in the headwaters of the stream. The sediment yield from unmined areas averaged about 25 tons per square mile per year, whereas from 1959 to 1962, erosion of the spoil banks in the Cane Branch basin resulted in an average yield of more than 27,000 tons per square mile of spoil bank per year. Sheet erosion on the gently sloping top of the spoil bank decreased appreciably, whereas loss of material by gully erosion increased with time. Erosion of abandoned coal haul roads in the Cane Branch basin was severe in places where the roads had steep grades. Since the fall of 1959, when mining ended on the northeast side of Cane Branch, there has been no overall reduction in the amount of sediment discharged by Cane Branch. However, the particle size of the sediment in transport and in the channel and flood-plain deposits of Cane Branch has become coarser since the 1959 mining. (See also W71-07935) (Knapp-USGS)
W71-07939

STREAM BOTTOM FAUNA,
Kentucky Dept. of Fish and Wildlife Resources, Frankfort.
J. P. Henly.
In: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky, 1955-66, Geological Survey Professional Paper 427-C, p C46-C49, 1970. 4 p, 3 fig, 3 tab.

Descriptors: *Water pollution effects, *Acid mine water, *Strip mines, *Strip mine wastes, *Benthic fauna, Kentucky, Aquatic life, Benthos, Mayflies, Sampling, Water quality, Toxicity.
Identifiers: *Beaver Creek Basin (Ky).

Strip mining of coal in the Cane Branch Basin of Beaver Creek, Kentucky affected the invertebrate bottom fauna of both Cane Branch and its receiving stream, Hughes Fork. Acid water and sediment that were subsequently transported to the stream from the strip-mined areas resulted in a loss of invertebrate bottom fauna in Cane Branch and Hughes Fork. In spite of a limited repopulation of benthic fauna observed in Hughes Fork in 1964, this loss can be expected to persist in both streams for many years. Not until the strip-mined area is healed and stream habitat restored will aquatic life return to the two streams in any great numbers. (See also W71-07935) (Knapp-USGS)

W71-07940

FISH POPULATION,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
J. R. Sheridan.
In: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky, 1955-66, Geological Survey Professional Paper 427-C, p C50-C53, 1970. 4 p, 1 fig, 4 tab.

Descriptors: *Water pollution effects, *Acid mine water, *Strip mines, *Toxicity, *Fishkill, Kentucky, Fish, Sampling, Hydrogen ion concentration, Water quality, Fish populations.
Identifiers: *Beaver Creek Basin (Ky).

Fish life disappeared from Cane Branch, Pennsylvania, when its water became highly acid as a result of strip mining of coal during the period 1955-56. The fish population in Hughes Fork, which received the acid water from Cane Branch, was severely restricted. Differences in pH among the streams are very evident, especially the contrast between Cane Branch and the unaffected streams. The pH of 3.2 measured in Cane Branch is lethal to fish; pH values of 5.5 and 6.0 for the affected part of Hughes Fork suggest that the stream is not toxic to all species; yet fish were not present. Some recovery apparently occurred by 1964 in Hughes Fork just above Freeman Fork, but it did not result in a fishable population. (See also W71-07935) (Knapp-USGS)
W71-07941

MICROBIOLOGY OF STREAMS,
Kentucky Univ., Lexington. Dept. of Microbiology.
R. H. Weaver, and H. D. Nash.
In: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky, 1955-66, Geological Survey Professional Paper 427-C, p C53-C57, 1970. 5 p, 1 fig, 4 tab.

Descriptors: *Aquatic microorganisms, *Acid mine water, *Strip mines, *Water pollution effects, *Kentucky, Sulfur bacteria, Water quality, Sulfates, Hydrogen ion concentration, Algae, Bacteria, Water pollution sources.
Identifiers: *Beaver Creek Basin (Ky).

Drainage from strip-mined areas appears to have affected the microflora of Cane Branch, Kentucky. Chemical oxidation of pyritic compounds found extensively in spoil banks has resulted in the formation of ferrous sulfate and sulfuric acid. This appears to have led to the establishment in the mined part of the Cane Branch study area of Ferrobacillus ferrooxidants, which contributes to the production of acid entering the stream. The lowering of pH has enabled this organism to exist throughout the stream from the vicinity of the spoil banks downstream to the gaging station. Standard plate counts show a much smaller number of saprophytic bacteria in Cane Branch than in Helton Branch. This, too, can be attributed to the low pH of Cane Branch. The filamentous fungi are more numerous and diversified in Cane Branch than in Helton Branch. In addition, the yeast, Rhodotorula, which is associated with increased acid production by Thiobacillus ferrooxidans, and the alga Bumilleria were isolated only from Cane Branch. (See also W71-07935) (Knapp-USGS)
W71-07942

TREE GROWTH,
Geological Survey, Washington, D.C.
R. S. Sigafoos.
In: Influences of Strip Mining on the Hydrologic Environment of Parts of Beaver Creek Basin, Kentucky, 1955-66, Geological Survey Professional Paper 427-C, p C57-C59, 1970. 3 p, 3 fig, 1 tab.

Descriptors: *Water pollution effects, *Strip mines, *Vegetation effects, *Trees, *Kentucky, Acid mine water, Sedimentation, Soil erosion, Land clearing, Water quality, Mine wastes.
Identifiers: *Beaver Creek Basin (Ky).

The net effect of strip mining upon the forests in the Cane Branch basin, Kentucky is negative. The area mined was cleared of trees at the time of mining, and after a recovery period of 10 years did not support the number of trees that a comparable area of abandoned cultivated land supported. Furthermore, some trees that were not destroyed at the time of mining subsequently died, probably because of burial by sediment, and other trees may have had their growth inhibited as a result of irrigation by mine drainage. (See also W71-07935) (Knapp-USGS)
W71-07943

COLUMBIA RIVER EFFECTS IN THE NORTHEAST PACIFIC, REPORT OF PROGRESS, JUNE 1969 THROUGH JUNE 1970,
Washington Univ., Seattle. Dept. of Oceanography.
Clifford A. Barnes.
Available from the National Technical Information Service as RLO-1725-180, $3.00 in paper copy, $0.95 in microfiche. Progress Report, July 10, 1970. 20 p, 8 fig, 1 tab, 3 append. USAEC Contract AT (45-1)-1725.

Descriptors: *Columbia River, *Water chemistry, *Aquatic microbiology, *Aquatic environment, Water pollution effects, Sedimentation, Water quality, Hydrology, Pacific Ocean.

Research conducted on the Columbia River effects in the Northeast Pacific Ocean by the Department of Oceanography of the University of Washington from June 1969 through June 1970 is summarized. The subject areas covered include (1) the physical, (2) the chemical-geochemical-geological-geophysical, and (3) biological aspects of the Columbia River system. The ocean area of primary interest to the project extends from San Francisco Bay at 38 degrees N to Vancouver Island at 49 degrees N, seaward some 600 km, and into the Strait of Juan de Fuca. (Knapp-USGS)
W71-07969

DEMONSTRATING THE EFFECTS OF NUTRIENTS IN BIO-OXIDATION POND RECEIVING STREAMS,
Oklahoma Univ., Norman. Bureau of Water Resources Research.
George W. Reid, Leale E. Streebin, and Oliver T. Love Jr.
Available from the National Technical Information Service as PB-199 269, $3.00 in paper copy, $0.95 in microfiche. Mar 1971. 72 p, 16 fig, 10 tab, 49 ref, append. Environmental Protection Agency Program 16010--03/71, Demonstration Grant WPD-98-01-66.

Descriptors: *Eutrophication, *Oxidation lagoons, *Sewage lagoons, Biodegradation, *Nutrients, Algae, *Degradation (Stream), Water pollution effects, Waste water treatment, Cyanophyte, Englenophyta, Organic loading.

This study considered the receiving stream as an integral part of the bio-oxidation pond method of treatment with the objective being to provide a better understanding of the bio-oxidation pond - receiving stream system. As representative of this 'real world' situation with all of its variables, five existing central Oklahoma bio-oxidation ponds which had diverse loadings and designs were utilized. By observing these systems under varying climatic conditions, the effects of the bio-oxidation pond nutrients along with other pollutional parameters which were discharged into intermittent receiving streams were evaluated. Except for scouring, bio-oxidation ponds and bio-oxidation pond receiving streams were found to behave essentially the same as the streams became a continuation of the pond. In addition to making biochemical adjustments, the streams lost much of their biological identity and assumed characteristics more closely associated with the biological loadings from the pond effluent. The most persistent algae in the systems were the flagellates (Euglenophyta) and the blue-green algae (Cyanophyta) as these plankters had little difficulty making the transition from their acclimated life in the pond to the stream.
W71-07973

ON BIOLOGICAL NITROGEN FIXATION IN NATURE, PARTICULARLY IN BLUE-GREEN ALGAE,
Carlsberg Laboratoriet, Copenhagen (Denmark).
For primary bibliographic entry see Field 02H.
W71-08024

RECORDS OF TUBIFICIDAE (OLIGOCHAETA) FROM THE GREAT LAKES (L MALAREN, VATTERN, AND L VANERN) OF SWEDEN,
Uppsala Univ. (Sweden). Dept. of Zoology.
Goran Milbrink.
Archiv fur Mikrobiologie, Vol 67, No 1, p 86-9
1970. 3 fig, 24 ref.

Descriptors: *Oligochaetes, *Lakes, *Tubifici
Water pollution, Indicators, Profundal zo
Sampling, Stratification.
Identifiers: Lake Malaren (Sweden), Lake Vatt
(Sweden), Lake Vanern (Sweden), Tubi
templetoni, Tubifex tubifex, Euilyodri
heuscheri, Euilyodrilus bedoti, Euilyodrilus vejd
skyi, Euilyodrilus moldaviensis, Euilyodrilus ha
moniensis, Bothrioneurum vejdovskyanum, A
lodrilus peuriseta, Aulodrilus limnobius, Aulodri
pigueti, Tubifex ignotus, Limnodrilus claparean
Psammoryctes albicola.

The primary aim of this study was to acquire m
information about the family Tubificidae
Sweden on which only a few scattered observati
were recorded--a shortcoming to applied limn
gy; several species are reliable indicators of wa
pollution, especially when occurring in char
teristic combinations. The tubificid values mo
refer to the profundal, where heterogeneity
material--caused, for instance, by small influ
local organic accumulations, and exposition--is
pronounced. Where representatives of the fami
Naididae, Enchytracidae, and Lumbriculidae
curred in the samples, these were recorded as w
So far 21 species of Tubificidae are known
Swedish habitats. All of them have been reporte
the three great lakes--Malaren, Vattern,
Vanern. The following eight species are recor
here, apparently for the first time, from Scandin
an fresh waters. Tubifex templetoni, Euilyodr
heuscheri (somewhat uncertain), E bedoti, E
dovskyi, E moldaviensis, Bothrioneurum vejd
skyanum, Aulodrilus limnobius, and A pigueti,
bifex ignotus and Limnodrilus claparendeanus
new to Sweden. Psammoryctes albicola and
lodrilus pluriseta have been recorded in Swe
only once before. Information is given on distr
tion of nine other Tubificidae, previously know
exist in that country. (Jones-Wisconsin)
W71-08025

POPULATION DYNAMICS AND SALIN TOLERANCE OF HYADESIA FUSCA (L MAN) (ACARINA, SARCOPTIFORMES) FR BRACKISH WATER ROCKPOOLS, W NOTES ON THE MICROENVIRONMENT SIDE ENTEROMORPHA TUBES,
Stockholm Univ. (Sweden). Asko Lab.;
Stockholm Univ. (Sweden). Dept. of Zoology.
Bjorn Ganning.
Oecologia (Berl), Vol 5, p 127-137, 1970. 5 fig
ref.

Descriptors: *Aquatic animals, *Aqu
microbiology, *Acaricides, Brackish w
Microenvironment, Littoral, Oxygen, Chem
reactions, Hydrogen ion concentration, A
Reproduction, Sampling, Seasonal, Bottom
ments, Ice, Amphipoda.
Identifiers: *Hyadesia fusca, *Sarcoptifor
*Rockpools, *Enteromorpha, Sweden, Tigri
brevicornis, Gammarus duebeni, Fucus serr
Fucus vesiculosus, Cladophora glomerata, He
cypris salinus, Gasterosteus aculeatus, Baltic
Nitocra spinipes.

salt water mite Hyadesia fusca has been rded in Scandinavia for the first time. It is en- restricted to the green alga Enteromorpha in littoral zones or in rockpools, and is the inant fauna of many brackish water rockpools. algae serve as substratum, food and breeding and give rise to violent fluctuations in abiotic ronmental parameters. Oxygen availability and ogen-ion activities do not differ greatly inside outside the algal thalli. During breeding in June July more than 900 animals, mostly larvae, be found on 0.1 gram Enteromorpha dry ht. In winter and average of 13 hibernating als were found per 0.1 gram algae. Copulation ws after a long precopula; newborn larvae are found near the rhizomes inside algal tubes. mite is very tolerant of salinity variations. lesia fusca is characteristic of rockpool ystems, often very abundant, one of the few romorpha grazers of the ecosystem and serves od for fishes in the system. Together with some r known crustaceans this mite, because of its ance and survival capabilities, must be con- ed one of the hardient members of the unsta- ockpool ecosystems. (Jones-Wisconsin) -08026

ROFLORA OF CHLORELLA K DURING A LONGED CULTIVATION OF THE ALGAE PERFUSION UNIT WITH A CONTINUAL YCLING OF THE CULTURE MEDIUM, (IN SIAN),

cow State Univ. (USSR). Faculty of Biology Soil Science.

. Pimenova, I. V. Maximova, G. I. Meleshko, Lebedeva, and T. B. Galkina.

ish summary. Mikrobiologiya, Vol 39, No 4, p 650, 1970. 1 fig, 3 tab, 17 ref.

riptors: *Laboratory tests, *Chlorella, *Cul- , *Aquatic microorganisms, Spores, Algae, logical studies, Mycobacterium, Pseu- onas, Bacteria.

tifiers: Perfusion unit, Flavobacterium, ococcus.

composition and density of microflora accom- ing Chlorella K were determined during a pro- ed cultivation of the algae in a perfusion unit a continual recycling of the nutrient medium. predominant organisms belonged to four ra: Mycobacterium, Flavobacterium, ococcus, and Pseudomonas. The latter were cularly numerous and diversified. The spore- ing cells did not exceed 0.01% of the total ber of bacteria. The fluctuation in the density ssociated microorganisms and spores were re- to performance of algae and the ratio een the photosynthetically active cells, parent , and autospores. (Wilde-Wisconsin) -08027

GANOCHLORINE INSECTICIDE INTERAC- NS AFFECTING RESIDUE STORAGE IN NBOW TROUT,

State Univ., Logan. Dept. of Animal Science; Utah State Univ., Logan. Ecology Center.

Mayer, Jr., J. C. Street, and J. M. Neuhold.

etin of Environmental Contamination and Tox- gy, Vol 5, No 4, p 300-310, 1970. 4 tab, 22 NWA Grant GM:1179 FWPCA Grant F1-WP-

riptors: *Chlorinated hydrocarbon insecti- s, *Retention, *Rainbow trout, Insecticides, , Dieldrin, Fish, Metabolism, Lipids, Enzymes. tifiers: *Residual insecticide interactions, *In- cide interactions, Tissues, DDE, Methox- or.

t organisms are probably exposed to several in- cides in their environments and many types been found to contain residues of more than insecticide. Insecticide interaction effects in ow trout simultaneously treated with up to organochlorine insecticides was studied with ion to residual insecticides accumulated in the ral fat body. DDT, methoxychlor, and dieldrin in three levels each were used in a randomized factorial design. Analysis was made for lipid content and residues. The insecticide-containing fraction was analyzed by gas chromatography with electron capture detection. Tissue storage of DDT and DDE increased when DDT and dieldrin were fed in combination. The response was the same as in rats, but was intensified in fish. Dieldrin storage was reduced by the presence of either DDT of methoxychlor. The effect of methoxychlor was more pronounced than that of DDT; feeding DDT with methoxychlor resulted in decreased methoxychlor storage. The influence of dieldrin on increasing tissue methoxychlor was highly significant. Insecticide interactions in fish and rats differ greatly. DDT, and possibly methoxychlor, could bring about a selective induction of drug metabolizing enzymes in the liver of trout. (Jones-Wisconsin) W71-08030

OXYGEN CONSUMPTION AND THE RESPIRATORY PIGMENT IN THE FRESH-WATER NEMERTEAN, PROSTOMA RUBRUM,

Bridgeport Univ., Conn. Dept. of Biology.

John J. Poluhowich.

Comparative Biochemistry and Physiology, Vol 36, p 817-821, 1970. 2 fig, 1 tab, 20 ref.

Descriptors: *Aquatic animals, *Oxygen, *Worms, *Respiration, Freshwater animals, Pigments, Fresh water, Weight, Metabolism, Connecticut, Anaerobic conditions.

Identifiers: *Nemerteans, *Prostoma rubrum, Heme-pigment, Hemoglobin, Phylum, Respiratory pigment.

Representatives of the Nemertea, acoelomate worms, inhabit marine, freshwater, and terrestrial environments. The oxygen consumption and respiratory rate of Prostoma rubrum were determined at 20C. The mean respiratory rate for 49 specimens was 0.700 microliters of oxygen/mg dry weight per hour. Oxygen consumption varied with the 0x478 power of the body weight. Treatment of the worms with gas mixtures having low oxygen tensions had little effect upon the respiratory rate. However, in similar atmosphere containing carbon monoxide, the oxygen consumptions were markedly reduced. The possibility exists that the respiratory enzymes of this animal are extremely sensitive to carbon monoxide and the decreased oxygen consumption in treated animals may reflect an interference by this gas. Chemical tests confirmed that the red coloration is, at least partially, due to the presence of a heme-containing pigment. Definite rhomboid crystals of the hemochromogen were observed in the Prostoma preparation after the addition of the Takayama reagent. Apparently the blood pigment of Prostoma rubrum allows it to respire at a constant rate under conditions of low oxygen tensions. (Jones-Wisconsin) W71-08031

FOOD NICHE AND CO-EXISTENCE IN LAKE-DWELLING TRICLADS,

North Wales Univ. College, Bangor (United Kingdom). Dept. of Zoology; and University Coll. of North Wales, Bangor. Dept. of Zoology.

T. B. Reynoldson, and R. W. Davies.

Journal of Animal Ecology, Vol 39, No 3, p 599-617, 1970. 3 fig, 16 tab, 24 ref.

Descriptors: *Worms, *Diets, *Distribution, Predation, Competition, Gastropods, Oligochaetes, Animal behavior, Aquatic populations, Food abundance, Lakes, Food habits, Laboratory tests.

Identifiers: *Coexistence, *Triclads, Britain, Food partitioning, Polycelis nigra, Polycelis tenuis, Interspecific competition, Dugesia polychroa, Dendrocoelum lacteum, Asellus, Serological technique, Intraspecific competition.

To explain distribution of four species of triclads living together in shallow littoral zones of British lakes, a hypothesis was developed relating to their distribution and abundance on the basis of interspecific competition for food. Because direct examination of the gut contents was unprofitable, a serological technique made possible the first comparative study of natural food of lake-dwelling triclads. A positive precipitin reaction obtained from a squash of a triclad when tested with the antisera indicates which prey had been consumed; a negative reaction indicates that these prey had not been consumed within the detection period. The triclad populations of 12 lakes, involving tests of 2282 animals were examined. Although the diets overlap, Polycelis tenuis and Polycelis nigra feed to a greater extent on oligochaetes, Dugesia polychroa on gastropods, and Dendrocoelum lacteum on Asellus. The distribution of Dendrocoelum lacteum is significantly associated with Asellus; it is not linked with the distribution of Gammarus another prey consumed less. While there were changes in proportions of the various prey at different seasons, diets were similar within a species and characteristic of that species. (Jones-Wisconsin) W71-08033

THE COPEPODA AND CLADOCERA OF A MISSOURI RIVER RESERVOIR: A COMPARISON OF SAMPLING IN THE RESERVOIR AND THE DISCHARGE,

Bureau of Sport Fisheries and Wildlife, Yankton, S.D.

Bruce C. Cowell.

Limnology and Oceanography, Vol 12, No 1, p 125-136, 1967. 6 fig, 4 tab, 17 ref.

Descriptors: *Measurement, *Plankton, *Automation, Sampling, Reservoirs, Copepods, Crustaceans, Missouri River, Standing crop, Lakes, Plankton nets, Zooplankton.

Identifiers: *Automatic sampler, Cladocerans, Gavins Point Dam (S D-Neb), Lewis and Clark Lake, Niobrara River (Neb).

Monitoring of plankton was accomplished by an automatic sampler installed at discharges from Lewis and Clark Lake. The results of sampling coincided with those obtained with tow nets. The annual discharge of Copepoda and Cladocera on wet basis was estimated in the proximity of 13 tons. The discharge was influenced by the inflow of zooplankton from Lake Francis, 80 km upstream, to a greater extent than by the inflow from tributary creeks. (See also W70-05422) (Wilde-Wisconsin) W71-08036

PRODUCTION OF MALE GAMETES AND AUXOSPORES IN A POLYMORPHIC CLONE OF THE CENTRIC DIATOM CYCLOTELLA,

Connecticut Univ., Storrs. Biological Sciences Group.

Mary E. Schultz, and Francis R. Trainor.

Canadian Journal of Botany, Vol 48, No 5, p 947-951, 1970. 3 fig, 3 tab, 12 ref. OWRR Project A-014-CONN (2).

Descriptors: *Diatoms, *Cytological studies, Salinity, Plant morphology.

Identifiers: *Cyclotella, Cyclotella cryptica, Cyclotella meneghiniana, Valve morphology, Auxospore production, Clones, Polymorphism, Toxonomy, Male gametes, Heterotrophs.

Increase in salinity of the medium induced the vegetative cells of Cyclotella clone (03A) to form male gametes and auxospores. During the clonal development of the auxospores, Cyclotella meneghiniana and C cryptica exhibited two valve patterns. Environmentally controlled valve morphology is distinguishable, the male gamete of the polymorphic clone being anteriously uniflagellate. (Wilde-Wisconsin) W71-08037

STUDIES ON THE POST-MORTEN IDENTIFICATION OF THE POLLUTANT IN FISH KILLED BY WATER POLLUTION--XII. ACUTE

POISONING WITH MERCURY (1), (IN JAPANESE),
Tohoku Univ. Sendai (Japan). Dept. of Fisheries; and Miyagi Technical Coll. (Japan). Dept. of Metal Engineering.
Yoshiko Haga, Hideo Haga, Tokiko Hagino, and Teiji Kariya.
English summary. Bulletin of the Japanese Society of Scientific Fisheries, Vol 36, No 3, p 225-231, 1970. 1 fig, 7 tab, 8 ref.

Descriptors: *Fish, *Water pollution effects, *Toxins, Aquatic animals, Aquatic environment, Chemical wastes, Inorganic compounds, Pollutant identification.
Identifiers: *Mercury, Carassius auratus, Tolerance limit, Gill, Kidney, Spleen, Abukuma River (Japan), Hirose-Natori River (Japan), Zacco platypus.

An attempt was made to detect mercury in fish killed by mercuric chloride in solution. The 48-hour median tolerance limit of mercuric chloride for goldfish lay between 1 and 0.5 ppm mercury and 5 ppm mercury was fatal in about 10 hours. Mercury content of control fish (fish killed by various concentrations) and of those living in 0.5 ppm mercury solution for 48 hours is given. Goldfish died in 0.5 ppm mercury solution within 6 or 7 days. Amount detected in dead fish is given. The distribution of mercury in seven parts of fish body was examined in two cases; the first being killed by mercury in solution and the second after soaking in mercury solution following death from suffocation. The first showed the highest value in the gills with that in the kidney next. In the second, mercury content showed low values in every part examined and scarcely detectable in spleen and kidney. Tests on some aquatic animals were performed to determine the possibility of mercury distribution in the Abukuma and Hirose-Natori Rivers with results indicating no mercury pollution. (Jones-Wisconsin)
W71-08038

DETERMINATION OF THE ACTIVITY OF HETEROTROPHIC MICROFLORA IN THE OCEAN USING C-14-CONTAINING ORGANIC MATTER,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
Yu. I. Sorokin.
Trans from MIKROBIOLOGIYA, Vol 3, No 1, Jan-Feb 1970. Microbiology (USSR) Vol 39, No 1, p 133-138, 1970. 5 fig, 4 tab, 22 ref.

Descriptors: *Oceans, *Organic matter, *Carbon radioisotopes, *Analytical techniques, *Marine microorganisms, Marine plants, Bacteria, Population, Hawaii, Absorption, Tropical regions, Pacific Ocean, Columns, Bottom sediments, Algae, Chlorella, Benthic flora, Mud, Microorganisms, Proteins, Radioactivity techniques, Food chains.
Identifiers: *Algal hydrolysate, Tonga Islands, Tutuila Island, Honshu Island, Open ocean, Saprophytes, Heterotrophic bacteria, C-14.

The possibility of using carbon-labeled dissolved organic matter (algal hydrolysate) for estimating the comparative activity of natural populations of microflora in the water column and bottom deposits was investigated in the tropical zone of the Pacific Ocean. The criterion for microfloral activity was the rate of bacterial assimilation of carbon-14 in experiments of short duration. The rate and utilization efficiency of labeled organic matter by sea water microflora depend on its initial concentration. The maximum utilization efficiency of dissolved organic matter by aquatic microflora for biosynthesis was 45%, staying quite high even when the initial concentration of labeled hydrolysate added was 1 to 2 mg/l. Supported is the idea that bacterial destruction of organic material in the ocean is limited to the upper water layer to a depth of 600 to 800 meters, with the maximum in the tropical zone at depths of 400-600. At great ocean depths the heterotrophic microflora is scant and slightly active. Information about the efficiency of utilization of dissolved organic matter by the aquatic microflora is of paramount importance for estimating its role as a link in the food chain. (Jones-Wisconsin)
W71-08042

SATELLITE FUNGI OF MANGANESE-OXIDIZING BACTERIA,
Moscow State Univ. (USSR). Dept. of Soil Biology.
T. G. Mirchink, K. M. Zaprometova, and D. G. Zvyagintsev.
Trans from MIKROBIOLOGIYA Vol 39, No 2, Mar-Apr 1970. Microbiology (USSR) Vol 39, No 2, p 327-330, Mar-Apr 1970. 3 fig, 2 tab, 15 ref.

Descriptors: *Fungi, *Manganese, *Bacteria, Microorganisms, Podzols, Soils, Oxidation.
Identifiers: *Satellite fungi, Manganese-oxidizing bacteria, Metallogenium, Moscow (USSR), Novgorod (USSR), Estonia (USSR), Coniothyrium fuckelii, Mycogone nigra, Fusarium Kuhni, Alternaria geophila, Cephalosporium. Sterile mycelium, Manganese-oxidizing, Soil agar.

This investigation was made to determine species of fungi which exist in soil together with Metallogenium, how great their diversity, and how often found in soddy podzolic soil. Twenty-one strains of fungi growing together with microorganisms of the genus Metallogenium were isolated from soddy podzolic soils of the Moscow and Novgorod regions and Estonian SSR with the use of soil agar. The isolated satellite fungi of Metallogenium are represented by the species: Coniothyrium fuckelii Sac, Mycogone nigra (Morgan) Jensen, Fusarium Kuhni (Fuck) Sac, Alternaria geophila Dasz, Cephalosporium, and forms of sterile mycelium. The colonies of microorganisms were located either directly on the hyphae or at some distance from the mycelium. Cultures of fungi growing together with Metallogenium were regularly isolated from all soils used. On the media used many isolated cultures formed fruit-bodies, on the basis of which most of them were identified. The development of Metallogenium was greatly inhibited on these media with the use of streptomycin. The data obtained indicate that not one specific species of fungus but various species, represented mainly by known forms but which have acquired a unique structure due to coexistence with Metallogenium, can be satellite fungi of Metallogenium. (Jones-Wisconsin)
W71-08043

THE EFFECTS OF RETURN IRRIGATION WATER ON THE BASAL LENS IN KAHUKU PLANTATION, OAHU AND PIONEER MILL AND HAWAIIAN COMMERCIAL AND SUGAR COMPANY PLANTATIONS ON MAUI,
Hawaii Univ., Honolulu.
Pedro A. Tenorio.
M. S. Thesis, Hawaii University, Aug 1970. 176 p, 66 fig, 7 tab, 54 ref, append. Project B-012-HI (2).

Descriptors: *Water pollution sources, *Water pollution effects, *Return flow, *Saline water intrusion, *Hawaii, Irrigation water, Water chemistry, Solutes, Nitrates, Salinity, Withdrawal, Groundwater, Groundwater movement, Leaching, Infiltration, Water quality.
Identifiers: Oahu (Hawaii), Maui (Hawaii).

The effects of irrigation return water on the quality of the basal groundwater bodies were identified and described in 3 areas on the islands of Oahu and Maui. Presently, all three areas are planted with sugarcane. Leaching of fertilizer components, principally nitrate and sulfate, into the basal aquifer occurs as a result of irrigation water application over the fields. Excessive withdrawals of the basal water in simple Ghyben-Herzberg lens accelerates saline water intrusion. All of the irrigation water sources from the three areas are suitable for the irrigation of sugarcane crop. (Knapp-USGS)
W71-08044

POLLUTION EFFECTS ON MICRO- A MEIOFAUNA OF SAND,
Leeds Univ. (England). Wellcome Marine Lab.
John S. Gray, and Ronald J. Ventilla.
Marine Pollution Bulletin, Vol 2, No 3, p 39-Mar 1971. 5 p, 10 fig, 2 tab, 8 ref.

Descriptors: *Water pollution effects, *Mar plants, *Oceans, *Coasts, *Sands, Sediments, M nicipal wastes, Industrial wastes, Sewage, Aqua plants, Growth rates, Growth stages.
Identifiers: *Microfauna, *Meiofauna.

The growth rates of a bacterivorous sediment-liv ciliate (Cristigera) was significantly slower in presence of low concentrations of heavy met The metals acted synergistically on the growth ra The technique is sensitive and rapid and could used as a reliable bioassay for assessing suspec polluted seawater. Temporal studies comparin suspected polluted and unpolluted beach show that they had significantly different numbers meiofauna. Such differences could not, howev categorically be related to pollution. A spa study at one beach showed a significant change numbers of meiofauna where sewage pollution curred. The spatial approach in indicating obj tively polluted areas for further study, should considered before long-term studies of temporal fects of pollution are attempted. (Woodard-USG W71-08082

THE PRINCIPAL ELECTRICAL A MECHANICAL PROPERTIES OF AEROSO APPLICATION TO HEALTH PHYSICS FRENCH),
Commissariat a l'Energie Atomique, Sac (France). Service de Protection Contre les Ra tions.
Claude Lasseur.
Bibliographie CEA-BIB-185, Service Central Documentation du CEA, Gif-sur-Yvette, Oct 19 56 p, 11 tab, 7 fig, 69 ref.

Descriptors: *Aerosols, *Electrical propert *Mechanical properties, *Public health, Sto law, Water pollution effects.
Identifiers: Ion mobility, Particle charge, Polar tion, Respiratory system.

The mechanical and electrical properties aerosols are analyzed. Stokes law and the limit its application, diffusion, and coagulation are c sidered. The polarization phenomena is bri mentioned. Examples of the applications, in he physics, of the different aerosol properties an the results obtained in the study of a model resp tory system are given. Methods and apparatus u in the study are described. (Ensign-PAI)
W71-08154

COASTS OF FRANCE, GENERAL STUDY CHEMICAL POLLUTION DISCHARGED IN THE SEA. INVENTORY AND STUDY OF TO ICITY, VOLUME III, ATLANTIC (IN FRENC
Centre d'Etudes et de Recherches de Biologie d'Oceanographie Medicale, Nice (France).
M. Aubert, J. Aubert, J. P. Gambarotta, B. Donnier, and M. Barelli.
Revue Internationale d'Oceanographie Medic Supplement, Tome III, 1970. 225 p.

Descriptors: *Water pollution sources, *Pollut *Chemical wastes, *Atlantic Ocean, Water po tion effects, Estuaries
Identifiers: French coastal areas.

There is no text. Tables, charts and graphs of supplement show the toxicity of industrial w water in the French littoral of the Atlantic Data ported include chemical, physical and biolog aspects of river discharge in the coastal estua (See also W71-07189 and W71-07190) (Ens PAI)
W71-08165

IRONMENTAL FACTORS AFFECTING AND ESTUARINE ECOSYSTEMS OF THE AS COAST,
tal Ecosystems Management, Inc., Fort h, Tex.
ert H. Parker, and William George Blanton.
lable from the National Technical Information ce as PB-197 042, $3.00 in paper copy, $0.95 icrofiche. Coastal Ecosystems Management rt 70-01, Nov 1970. 182 p.

riptors: *Environmental effects, *Estuaries onment, *Estuaries, *Water pollution effects, ity, Ecology, Ion transport, Brine disposal, Coasts, Bays, Temperature, Aquatic life, Oil try.
ifiers: Coastal topographic features, Oil base , Ion density concentration.

200,000 data points relating to range of enmental factors in all major Texas estuaries Louisiana to Mexico were utilized to establish bility of total salinity and constituent ions in estuaries. This was done to determine possiffects of oil field brines upon Texas coastal stems. Diversity and faunal abundance were ared with environmental variability. Baseline s for benthic and nektonic populations were lished for both undisturbed and industrially bed estuaries. In all bays, salinity and temure variations were very pronounced, geoically and temporally. Range of variation and winter and summer salinities could be ly correlated with sizes and diversity of l populations and with major changes from o year to seafoods. Data from 572 stations ng to ionic constituents of Texas bay waters statistically evaluated for their variability and ated into 'ionic balance' format. Extreme ility from time to time, and place to place nstrated that this concept of 'ionic balance' is d in estuaries systems.
08181

EFFECTS OF SALINITY STANDARDS ON GATED AGRICULTURE IN THE ORADO RIVER BASIN,
al Water Pollution Control Administration, er. Colorado River - Bonneville Basins Of-

rimary bibliographic entry see Field 05G.
08222

TRIC POWER AND THERMAL HARGES; THERMAL CONSIDERATIONS IE PRODUCTION OF ELECTRIC POWER.
rimary bibliographic entry see Field 05B.
08298

TRUM OF BIOLOGICAL CONCERNS POWER PLANT THERMAL HARGES,
Hopkins Univ., Baltimore, Md. Dept. of raphy and Environmental Engineering.
D. Jensen.
ectric Power and Thermal Discharges; Ther- onsiderations in the Production of Electric . Gordon and Breach, New York, p 47-73, 5 fig, 10 ref.

iptors: *Thermal powerplants, *Biota, ior, *Thermal stress, Speciation, *Acclimation, *Reproduction, *Physiological ecolo- Growth rates, Growth stages, Benefits, Therollution.
fiers: *Thermal tolerance, *Biocides, Heat gism, Temperature response, Extremal temres.

iological rationale for water quality criteria to ize the environmental effects of power ation while at the same time maximizing the ts of economical power generation for manwill require the early involvement of ecolo- engineers and other specialists in the siting, and operation of steam electric generating stations. The author discusses thermal tolerance of aquatic organisms in different life stages, reaction of individual species to heat, speciation resulting from thermal stress, heat synergism and order of duration of temperature response. Fluctuations in temperature have been shown to have as great an effect on organisms as extremal temperatures, the effect being most stressing when the amplitude of change and its rate are greatest. Some beneficial effects of increased temperatures are pointed out. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08302

IMPACTS OF THERMAL ALTERATIONS ON ESTUARINE AND COASTAL ENVIRONMENTS,
Virginia Inst. of Mari ne Science, Gloucester Point.
W. J. Hargis, and J. E. Warinner.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York p 75-141, 1971. 11 fig, 2 tab, 45 ref.

Descriptors: *Estuarine environment, *Thermal powerplants, *Heated water, *Environmental effects, Design criteria, Water quality control, Sites, Biota, Thermal stress.
Identifiers: *Coastal environment, Heat utilization, Thermal tolerance, Biocides, Temperature response, Aquatic life.

On the basis of extensive literature study the authors arrive at the conclusion that releases of heat into tidal and marine environment must be carefully tailored and managed. Every effort should be bent toward developing methods to use the heated effluents in productive ways. These activities should, among the others, entail (1) development of adequate institutional mechanisms, (2) development of mathematical and hydraulic models for every major marine or coastal system, (3) more adequate siting criteria and water quality criteria and standards, (4) development of more flexibility in regional and interregional generating systems, (5) development of more adequate effluent pre-cooling systems and techniques to use the heat productively, (6) more efficient means of reducing environmental heat loading. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08303

CONFERENCE ON IMPACT OF FUTURE ELECTRIC POWER REQUIREMENTS IN THE STATE OF MINNESOTA - AN ISSUE ANALYSIS.
Minnosota Univ., Minneapolis. Water Resources Research Center.

Available from the National Technical Information Service as PB-199 542, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Minnesota University, Graduate School, WRRC Bulletin 28, p 38, Feb 1971. OWRR Project A-999-Minn (1).

Descriptors: *Electric power demand, *Electric power production, *Thermal powerplants, *Environmental effects, *Thermal pollution, Air pollution, Solid wastes, Economic impact, Radiation, Transmission lines, *Minnesota.

The objectives of the conference were to discuss future electric energy needs in the state of Minnesota and alternative means for meeting these requirements. Issues identified were associated with: impact of power plant and transmission line proliferation on the natural environment, on the economics, on the life of the people, on the politico-legal situation in the affected areas and on the state if power plants and transmission lines are not built. Potential thermal water pollution was discussed, together with potential air pollution, solid wastes disposal problems, radiation hazards, land management schemes, and potential depletion of natural resources. The emphasis was on examination of all possible issues and not on problem solution. (Oleszkiewicz-Vanderbilt)
W71-08317

BACKGROUND STUDY FOR POND COOLING FOR INDUSTRY,
Oregon State Univ., Corvallis.
Fred W. Decker.
AEC AT (45-1). Mar 31, 1970. RLO-2218-1, 53 p.

Descriptors: *Thermal powerplants, *Nuclear powerplants, *Heated water, *Cooling towers, Rivers, Lakes, Fog, Biota, Thermal pollution.
Identifiers: *Cooling ponds.

The use of lakes and slack water for the disposition of waste heat from thermal power plants was studied based on European experience. Scientists appear preoccupied with the establishment of limits to the allowable discharge of heat into streams. In Switzerland and Bavaria work continues on the prescription of the limits as to how much and in what manner heat may discharge into streams. In the Netherlands already the forecast emerges of eventually more heat than the Rhine and impounded waters can handle. In France studies seek to specify limits for discharge of heat into the inland slack waters of major controlled rivers. In Britain the studies of a lake used for cooling a nuclear power plant will reveal objective data on the modifications in the lake conditions, but new construction generally assumes the use of cooling towers because of the general shortage of water available for cooling. It appears that cooling towers have superseded other methods for heat discharge and that increasingly many new major industrial units can no longer seriously consider rivers and lakes for their heat sinks, at least from a standpoint of economic advantage to themselves. (Oleszkiewicy-Vanderbilt)
W71-08318

A COMPREHENSIVE APPRAISAL OF THE EFFECTS OF COOLING WATER DISCHARGE ON AQUATIC ECOSYSTEMS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
Arthur A. Levin, Birch J. Thomas, Robert E. Hillman, and Gilbert E. Raines.
Columbus, Ohio, 1970. 45 p, 9 fig, 2 tab, 137 ref.

Descriptors: *Thermal pollution, *Heated water, *Cooling water, *Aquatic environment, *Dissolved oxygen, Water temperature, Fishkill, Environmental effects, Parositism, Aquatic populations.
Identifiers: *Aquatic ecosystems, Thermal tolerances.

A discussion of the effects of cooling water discharge on receiving waters is given in the present report. It is stated that one of the most important effects on the aquatic ecosystem is the response of the aquatic biota either as a direct result of an increase in water temperature or as a subsequent result of physical-chemical changes of the water due to an increase in water temperature, such as: density, viscosity, vapor pressure, surface tension, solubility of dissolved gases in water, etc. can cause stratification of bodies of water, increase in evaporation and rate of biochemical reactions. Elevated temperatures increase the metabolic rate of most organisms until the upper lethal limit is reached. Analysis of the ability of water to hold adequate concentrations of dissolved oxygen to support aquatic organisms are also given. It is concluded that whether actively managed for the benefit of man or passively observed for their impact, thermal additions will cause environmental changes. With most of the actual operating plants, the changes due to thermal additions have not proved to be harmful. No major fishkills due to thermal effluents have been observed of operating power plants. (Herrera-Vanderbilt)
W71-08319

5D. Waste Treatment Processes

COST AND MANPOWER FOR MUNICIPAL WASTE WATER TREATMENT PLANT OPERATION AND MAINTENANCE,
Federal Water Quality Administration, Washington, D.C. Construction Grants and Engineering Branch.
R. L. Michel.
Journal Water Pollution Control Federation, Vol 42, p 1883-1915, Nov 1970. 20 fig, 31 tab, 9 ref.

Descriptors: *Costs, *Waste water treatment, *Operation and maintenance, Correlation analysis, Trickling filters, Lagoons.
Identifiers: *Total population equivalent, *Industrial population equivalent, Total weekly man-hours, Sludge process, Power consumption.

An analysis was made of the operation and maintenance expenditure and manpower requirements for waste water treatment works as reported for some 1,600 such audits during the period January 1965 to June 1968. A statistical test (simple linear correlation) was used to determine the trends between the following combinations of variables: (1) Total annual cost vs. average flow rate; (2) Total annual cost vs. population equivalent load; (3) Annual labor cost vs. average flow rate; (4) Annual labor cost vs. population equivalent load; (5) Annual electricity cost vs. average flow rate; (6) Annual electricity cost vs. population equivalent load; (7) Annual chemical cost vs. average flow rate; (8) Ahhual chemical cost vs. population equivalent load; (9) Total weekly man-hours vs. average flow rate; (10) Total weekly man-hours vs. population equivalent load. All the results were plotted on figures. In general, the cost patterns derived from this study were very similar to those derived from the 1,500 reports of a different set of plants audited between 1962 and 1965. (Wang-Rutgers)
W71-07743

ECONOMIC EVALUATION: ALTERNATIVES FOR INDUSTRIAL TREATMENT,
Wichita State Univ., Kans.
K. Q. Camin.
Water and Sewage Works, Vol 116, No 7, p IW/10 - IW/13, July 1969. 4 tab, 1 fig.

Descriptors: *Evaluation, *Costs, Biochemical oxygen demand, Discount rate, Trickling filters, Operation and maintenance, Cost comparisons.
Identifiers: *Alternatives, *Industrial waste treatment, Municipal waste treatment, Waste water strength.

With reduction of pollution content as their goal, industries whose manufacturing processes generate substantial wasteloads usually have several alternative solutions. This paper discussed what waste treatment alternative would give a specified amount of waste reduction at minimum cost. To illustrate the theory and method of evaluation, emphasis was placed upon 'municipal waste treatment' and 'industrial waste treatment.' It indicated that a change in wasteload (lb of BOD) per unit of product varied directly with waste water volume per unit of product. Cost for municipal treatment and industrial treatment were discussed respectively. For meaningful comparison all cost streams were converted into present value. It was noted that the optimal choice would change if the discount rate or the time horizon were different. (Wang-Rutgers)
W71-07752

CHEMICAL TREATMENT OF COMBINED SEWER OVERFLOWS.
Dow Chemical Co., Midland, Mich.

Copy available from GPO, Sup Doc as EP2.10:11023FDB $1.50; microfiche from NTIS as PB-199 070, $0.95. EPA Report 11023 FDB--09/70, Sept 1970. 185 p, 56 fig, 50 tab, 54 ref. EPA-WQO Contract No 14-12-9.

Descriptors: *Water pollution control, *Flocculation, Sedimentation, Storms, Runoff, Flow rates, Biochemical oxygen demand, Coliforms, Pumps, Chlorination, Disinfection, Baffles, Weirs, Waste water treatment, *Sewers, *Overflow.
Identifiers: *Combined sewers, Purifloc C31, Purifloc C32.

Less than 8% of the total sanitary sewage flow collected in the Milk River combined sewer has been by-passed during periods of storm overflow during the past 8 years. Total overflow volumes did not exceed 5.5 million cubic ft. 90% of the time. Initial BOD over 18 samples ranged from 23 mg/l to 376 mg/l with an average of 110 mg/l, while suspended solids averaged 249 mg/l. On final samples taken during the same period, BOD values averaged 42 mg/l and SS values averaged 67 mg/l. Chlorine demand for 56 influent samples averaged 7.7 mg/l. The receiving waters for these overflows were characterized by visual observation as being highly polluted. Cationic polymeric flocculants and flocculent aids were tested on combined overflows from the sewer system. It was found that the existing Milk River pumping station and retention basin were suitable for modification, namely the addition of weirs and variable rate pumping, to achieve an average SS removal of 63%. The installation of disinfection equipment was estimated to cost $20,625 with $7,700 annually for chemical costs. This equipment would produce a coliform density of 1000/100 ml at an average cost of approximately $.012/1000 gallons. (Lowry-Texas)
W71-07755

RENOVATION OF MUNICIPAL WASTE WATER BY REVERSE OSMOSIS,
Environmental Protection Agency, Cincinnatti, Ohio. Environmental Research Lab.
John M. Smith, Arthur N. Masse, and Robert P. Miele.
Copy available from GPO, Sup Doc as EP2.10:17040-05/70, $0.65; microfiche from NTIS as PB-199 067, $0.95. EPA Report 17040--05/70, May 1970. 59 p, 23 fig, 17 tab, 12 ref.

Descriptors: *Reverse osmosis, *Municipal wastes, Separation techniques, Desalination processes, Demineralization, Semi-permeable membranes, *Water re-use, Pressure, Hydrogen ion concentration, Filtration, Adsorption, Sedimentation, Pilot plants, Cost analysis, *Waste water treatment, Osmosis, *Membranes.
Identifiers: Flux, Rejection, Membrane fouling.

The three major configurations of reverse osmosis units include spiral wound units, tubular units, and plate and frame units. Tests were conducted on prototype units employing all three configurations, and the membranes were found capable of rejecting 93 to 95% of TDS, 90 to 99% of phosphates, 80 to 90% of ammonia nitrogen, 60 to 70% of nitrate nitrogen, 99 to 100% of particulate matter, 90 to 95% of TOC and greater than 90% of COD. Many of the problems discovered stemmed from the use of prototype units which had not been throughly tested and were subject to repeated mechanical failures. Fouling problems have been partially alleviated by periodically depressurizing the membranes and washing them with enzyme detergents. The success of this method is attributed to protein hydrolysis of the slime layer which coats the membrane. Increasing population has dictated the recycling of a much larger portion of the nation's water. Each time it is re-used, the water picks up greate amounts of dissolved solids. These solids will eventually have to be removed to preserve the potability of drinking water. At present, reverse osmosis techniques are the most promising methods for dissolved solids removals. Also, increasing advances in membrane materials have steadily decreased the cost of reverse osmosis to the point that a reverse osmosis system coupled with primary and sand filtration only has an estimated cost of 35.4 cents/1000 gallons. This figure is equal to the cost of conventional activated sludge treatment plus filtration and carbon adsorption. (Lowry-Texas)
W71-07756

CANNERY WASTE TREATMENT - KEHR ... TIVATED SLUDGE,
FMC Corp., Santa Clara, Calif. Environmental ... gineering Dept.
Robert A. Fisher.
Copy available from GPO, Sup Doc ... EP2.10:12060EZP--09/70, $0.70; microfiche ... NTIS as PB-199 071, $0.95. EPA Re... 12060EZP--09/70. 67 p, 20 fig, 15 tab, 7 ref.

Descriptors: *Activated sludge, *Cannery wa... Industrial wastes, Municipal wastes, Biochem... oxygen demand, Nutrients, Aeration, Mixing, S... mentation, Pilot plants, Design parameters, ... analysis, *Waste water treatment.
Identifiers: *Kehr activated sludge, Total org... carbon, Electroflotation, BOD5.

The Kehr modification of the activated sl... process uses a completely mixed aeration tank ... no intentional solids wasting. After the aera... tank stabilized at between 4000 and 12,000 mg... MLSS, a 40 day investigation using municipal ... cannery wastes of strengths from 200 to 2000 ... BOD5 was conducted. 90% BOD5 and 80% ... reductions were achieved, but little or no reduc... was detected in nitrates and phosphates and th... fluent was colored and turbid. Periods of little ... loading for as long as 48 hours caused no decr... in treatment efficiency when flow was resu... From the above information, KASP was recogn... as being well suited to industrial waste pre-t... ment prior to discharge to a municipal treat... plant. The ability to handle intermittent flows ... vide 90% BOD5 removal, and provide aer... digestion of solids in the aeration tank is esse... for pre-treatment devices and all are possesse... KASP. Exclusive of primary treatment, treat... of 10 mgd of a 250 mg/l BOD5 waste would c... cents/1000 gallons using gravity settling. Bec... of operational problems and high power dem... the use of the electroflotation instead of gravity ... tling would increase costs to 29 cents/1000 ga... treated. In each instance, however, the varia... of industrial wastes demands pilot plant studi... determine actual design criteria and cost estim... (Lowry-Texas)
W71-07757

TREATMENT OF SOLE LEATHER VEGE... BLE TANNERY WASTES,
Cincinnatti Univ., Ohio. Environmental Healt... gineering.
J. David Eye.
Copy available from GPO, Sup Doc as ... 13/4:12120, $1.25; microfiche from NTIS as ... 199 068, $0.95. EPA Report 12120--09/70, ... 1970. 112 p, 21 fig, 25 tab, 23 ref.

Descriptors: *Industrial wastes, *Lagoons, An... bic conditions, Aerobic conditions, Pilot pl... Design criteria, Pre-treatment (Water), Sedim... tion, Screens, Temperature, Color, Odor, Tu... Lime, Cost analysis, *Waste water treatment, ... Virginia.
Identifiers: *Tanneries, Marlinton.

A three year study was conducted to determin... feasibility of treating tannery wastes biological... pilot plant was operated first to determine ... design parameters, after which a full scale sy... was constructed. The full scale system consis... specialized pre-treatment of segregated ... streams, primary clarification, and an anaer... aerobic lagoon system. 10 mg/l of anionic poly... trolyte was added to the primary clarifi... enhance settling. At clarifier overflow rates ra... from 1600 to 2500 gpd/sq ft, 80 to 90% remo... suspended lime particles was obtained. Loadi... the lagoons ranged from 2-20 lbs BOD/day/... cu ft with removals ranging from 80 to 95% ... during cold weather, when removals in the 65... range were observed. Odors emanating fro... lagoons were effectively controlled through th... dition of spent vegetable tan liquors. Fou... problems were solved through use of high pre... nozzles. However, these nozzles could not be ... when the temperature was below freezing. ... main concern of tanneries should be dir...

ards waste flow minimization and pretreatment. of the pollutional load is present in 30% of the e volume. Education of operating personnel is rime importance in reducing flows to reduce s. The total cost of the systems as installed at linton was $40,000, with operating costs aging $15,000/year or $.07/hide processed a flow of 1 million gallons/week. Further, is necessary in color removal and disinfec- Studies on combined treatment of municipal tannery wastes are also needed since both the ery and municipality could conceivably benefit such an arrangement. (Lowry-Texas)
-07758

NOLIC WASTE RE-USE BY DIATOMITE TRATION,
s-Manville Products Corp., Manville, N.J.
Merrill.
y available from GPO, Sup Doc as 3/4:12080EZF, $1.25; microfiche from NTIS B-199 069, $0.95. EPA Report 12080 EZF--0, Sept 1970. 125 p, 25 fig, 17 tab. FWQA t WPRD 87-01-68.

criptors: *Phenols, Resin, *Water re-use, gn criteria, Chemical precipitation, Screens, ration, Diatomaceous earth, Mixing, Dewater- Hydrogen ion concentration, Cost analysis, In- rial wastes, *Waste water treatment, New Jer-

tifiers: Fiberglass, Suspended solids.

rglass production involves the use of an expen- phenolic resin. A 28 month study was con- ed to determine the feasibility of reclaming rs which had been used for washing resins off nveyor lines to prevent fouling. The system loped reduces water consumption by utilizing gpm, 1000 psi spray cleaner. After the con- rs are washed, the water flows through two es of screening, or primary filtration, and a ndary diatomite filtration unit. Since most of olids are large, the diatomite filters accomplish removal of only .6% of the total solids load, the major removals taking place at the pre- ning equipment. The water re-use system will he same water 4.5 times before it is completely orated, requiring 1 lb of diatomite/500 gallons ater filtered. The system provides water at a cost of $.37/1000 gallons as compared to /1000 gallons for city water. Substantial opera- l savings have been realized through conserva- of the expensive phenolic binder. A net 'before income return of 9.5% has been obtained on approximately $165,000 invested. In addition, e phenolic discharges have dropped 80%, nded solids have decreased 83%, and dis- d solids have decreased by 50%. In this in- ce, therefore, waste discharge control has both ected the environment and profited the indus- Lowry-Texas)
-07759

tment techniques for removing phosphorous municipal waste waters,
ronmental Protection Agency, Cincinnatti, . Environmental Research Lab.
J. Convery.
y available from GPO, Sup Doc as 10:17010--01-70, $0.50; microfiche from S as PB-199 072, $0.95. EPA Report 17010--0, Jan 1970. 35 p, 13 fig, 17 tab, 25 ref.

criptors: *Phosphates, Filtration, *Chemical ipitation, Coagulation, Sedimentation, Lime, linity, Hydrogen ion concentration, tralization, Turbidity, Flexibility, Tertiary tment, *Cost analysis, Economic feasibility, ste water treatment.

ogical uptake, chemical precipitation of solu- hosphorus, and settling or filtration of particu- phosphorus are the major removal mechanisms in phosphorus removal. At present, chemical ipitation is the most universally applied hod. The wide variety of chemical reaction which lead to phosphorus precipitation allows much flexibility of operation to plant operators. In dealing with raw sewage, primary effluent, or secondary effluent the size of the plant, influent waste water characteristics phosphorus discharge standard, and the types of other processes used in the treatment train must all be considered. In addition to phosphorus removal, higher levels of BOD and suspended solids removals are customarily obtained when some type of phosphate reduction mechanism is employed. Each of the mechanisms described here have been analyzed both with respect to technological and economic feasibility. Costs ranged from 13 cents/1000 gallons for two-stage lime treatment of 1 mgd to achieve 97% removal, to a potential low of $.015/1000 gallons using waste pickle liquor to achieve a reduction of 80%. (Lowry-Texas)
W71-07760

THE THERMAL STABILITY OF NITRILOTRIACETIC ACID AND ITS SALTS IN AQUEOUS SOLUTIONS,
Naval Research Lab., Washington, D.C.
David L. Venezky, and William B. Moniz.
Available from the National Technical Information Service as AD-715 776, $3.00 in paper copy, $0.95 in microfiche. NRL Report 7192, Nov 17, 1970. 11 p, 6 fig, 6 ref. NRL Problems CO5-29 and CO7-04 Project No RR007-02-41-5678 and RR001-05-42-4806.

Descriptors: *Temperature, *Stability, Chelation, Sludge, Hydrogen ion concentration, Waste water treatment, *Chemical precipitation.
Identifiers: *Thermal decomposition, Complexing, Nuclear magnetic resonance, Proton magnetic resonance, Nitrilotriacetic acid, *NTA.

H4EDTA and its salts may decompose thermally through a hydrogen three-centered bridge structure intermediate. By comparison, the thermal decomposition of H3NTA and its salts was studied using nuclear magnetic resonance techniques, since NTA is similar to EDTA, except that it cannot form the bridge structured intermediate mentioned previously. NMR studies at 200C for periods ranging from 1 hour to 670 hours were conducted on degassed and undegassed aqueous solutions of Na3NTA, Na2HNTA, and a degassed solution of H3NTA. Periodic proton magnetic resonance examination showed dissolved oxygen to have little or no effect on Na3NTA and Na2HNTA solution decomposition. Testing results showed NTA3- to be far more stable than EDTA4- at 200C. Extension of this data to the 300C to 320C range is not possible without additional testing. However, at 200C in basic solutions uncomplexed and weakly complexed NTA3- is stable enough to use as a boiler-water additive for sludge control and feedwater conditioning. Such use should produce minimal water contamination from thermally decomposed NTA3-, which could occur only after prolonged heating. (Lowry-Texas)
W71-07761

MAGNETIC FLOCCULATION REMOVES METALLIC SOLIDS.
Ericz Magnetics, Eric, Pa.

Water and Sewage Works, Vol 118, No 3, p IW/12-IW/13, Mar 1970.

Descriptors: *Waste water treatment, *Separation techniques, *Flocculation, Coagulation, Sedimentation, Settling velocity, Metals, Industrial wastes, Flow rate, Pennsylvania.
Identifiers: *Magnetic flocculation, Metallic wastes (Steel).

Metallic contaminants in waste water from steel plants have long required large settling basins with long detention times. Various chemical coagulation and flocculation agents have been tried with limited success, usually accountable to prohibitive cost. The development of a magnetic process, however, has doubled the settling rate of the floc with a 50% decrease in the amount of flocculants required. Also, magnetic solids entrap non-magnetic solids while they are settling to provide a sweeping effect. This phenomenon has stimulated interest in the addition of Basic Oxygen Furnace Dust to waste waters which do not contain any metallic particles. This BOF dust, when magnetized acts as a coagulant aid. Several combined chemical-magnetic flocculation units are already in use. A unit designed for Allegheny Ludium Steel Corporation treats approximately 3500 gpm by subjecting the waste water to a minimum field intensity of 800 gauss for 1/20 seconds. This water originates from the BOF units, but it can also be mixed with waters from the cupola scrubbers. The system then depends upon the magnetized flocs to clear the water of non-magnetized solids as well. At present, no reliable cost analysis has been performed, but research into magnetic treatment is continuing. (Lowry-Texas)
W71-07762

A PERFORMANCE ANALYSIS OF AN ACTIVATED SLUDGE TREATMENT PLANT,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
D. F. Carr, and J. Ganczarczyk.
University of Toronto, Department of Civil Engineering, Publication No. 71-600, Feb 1971. 17 p, 10 fig, 7 tab, 4 ref. NRC Grant No A7598.

Descriptors: *Activated sludge, Evaluation, Performance, Statistical methods, Analytical techniques, Sampling, Flow measurements, Biochemical oxygen demand, Dissolved oxygen, *Waste water treatment, *Sludge treatment, *Treatment facilities.
Identifiers: Sludge loading factor, Sludge volume index, Mixed liquor suspended solids, Toronto, Canada.

The difficulty in accurately modeling or scaling various parameters in laboratory scale studies of the activated sludge process has led to attempts to obtain design data from full scale operating plants. It was determined that for this particular test, conducted at the Lakeview Sewage Treatment Plant near Toronto, the flow measurements and sampling procedures applied, as well as the scope of the analytical tests performed were insufficient to provide reliable evaluation of performance. Some interesting results from the study were: (1) simple statistical procedures may greatly improve the extent and quality of information to be drawn from operational data; (2) there seemed to be a total lack of correlation between final effluent BOD and the sludge loading factor; (3) little or no correlation existed between the SVI and the sludge loading factor; and (4) there was an increase of the SVI with an increase in the sludge return rate. The following conclusions were drawn from the study: (1) low plant effluent quality at the Lakeview Plant is due primarily to specific plant influent characteristics; (2) modification of the scope of plant metering and sampling procedures, and expansion of the analytical tests is essential to more fully characterize and explain the performance of the treatment facilities. (Lowry-Texas)
W71-07763

DETERMINATION OF FLOTABLE SUBSTANCES IN WASTE WATER,
Sacramento State Coll., Calif. Dept. of Civil Engineering.
D. J. Hinrichs, K. D. Kerri, and J. Paterson.
Water and Sewage Works, VOL 118, No 3, p 70-74, MAR 1971. 4 FIG, 1 TAB, 3 REF.

Descriptors: *Water analysis, *Flotation, Analytical techniques, Sampling, Stratification, Design criteria, Cost analyses, Economic feasibility, Waste water treatment, *Separation techniques.
Identifiers: Flotable solids, Settleable solids.

The presence of flotable solids in waste water, in the form of films and scums, and the resulting design necessary to remove these flotables from the

surface and convey them to specialized treatment facilities, has created a need for a specific test to determine the amount of flotables present. In response to this need, an apparatus has been built, and a testing procedure developed. The apparatus consists of two Imhoff cones fastened together at the large ends. The total cost of manufacturing such a device in the laboratory was $41.00. There are no chemical costs, and thorough cleaning is the only maintenance required. The unit has no instrumentation and draws no electrical power. The test itself requires a minimum of time to perform. Accuracy is impaired only by the difficulty in obtaining a representative sample, and in keeping the sample mixed before the actual test begins. Collection of a representative sample, however, is a problem pertinent to all waste water examinations, and so should not be included as a drawback for this particular system. Also, the stratification of the sample does not prevent a serious obstacle, since the averaging of several tests will eliminate any inaccuracies due to stratification. (Lowry-Texas)
W71-07764

ISOLATION OF POLIOVIRUS FROM DRINKING WATER,
Michigan State Univ., East Lansing. Dept. of Microbiology.
For primary bibliographic entry see Field 05F.
W71-07765

KINETIC CONSTANTS FOR AEROBIC GROWTH OF MICROBIAL POPULATIONS SELECTED WITH VARIOUS SINGLE COMPOUNDS AND WITH MUNICIPAL WASTES AS SUBSTRATES,
Oklahoma State Univ., Stillwater.
K. M. Peil, and A. F. Gaudy, Jr.
Applied Microbiology, Vol 21, No 2, p 253-256, Feb 1971. 2 fig, 2 tab, 7 ref.

Descriptors: *Kinetic constants, *Aerobic growth, *Biological treatment, Organic waste, Heterogeneity, Growth rate, Sewage, Culture, Waste water treatment.
Identifiers: Substrates, *Microbial populations.

Previous studies by the authors showed that the Monod relationship (U—Um (S)k sub s..S) best describes the growth of heterogeneous populations in a synthetic waste water containing glucose as the sole carbon source and limiting nutrient. This study is to extend on the usefulness of the above idea by testing the applicability of the Monod equation to heterogeneous populations growing on various substrates. 27 sets of experiments were undertaken, 25 with various pure compounds as sole source of carbon and 2 with sewage. The sewage was concentrated at 65C and 55C. The concentrate was slightly alkaline, pH 8.5. Description of the materials and methods used are given. In general hyperbolic curves were obtained in plots of U versus S. A table showing values of Um and K sub s is given. Thus the above study concludes that the hyperbolic function can be used to describe the relation between growth kinetics and substrate concentrations for systems which may be heterogeneous with respect to both species of microbe and carbon sources. (Rayaan-Texas)
W71-07766

LOW-LEVEL RADIOACTIVE WASTE TREATMENTS: THE WATER RECYCLE PROCESS,
Oak Ridge National Lab., Tenn.
W. C. Yee, F. Delora, and W. E. Shockey.
Oak Ridge National Laboratory No ORNL-4472-UC-70-Waste Disposal and Processing. 30 p, 10 fig, 2 tab, 18 ref. AEC Contract No W-7405-eng-26.

Descriptors: *Nuclear power plants, *Water reuse, *Waste water treatment, Water pollution control, Water treatment, Radioisotopes, Detergents, Pilot plants, Ion exchange, Demineralization, Zeta potential, Coagulation, Mixing, Filtration, Membranes, Adsorption, Turbidity.
Identifiers: *Radioactive contaminants, *Decontamination factors.

Re-cycle of water has become increasingly popular, with the atomic energy industry being no exception. A re-cycle process for decontaminating low-level radioactive aqueous wastes and recycling the purified water for re-use at nuclear installations has been successfully developed and demonstrated through several cycles in a micro-pilot plant. The wastes used were ORNL wastes containing low concentrations of salts and radionuclides. The process includes the following steps: (1) clarification; (2) demineralization; and (3) activated carbon treatment. Zeta potential controlled additions of alum, activated silica and nonionic organic polyelectrolyte provided excellent coagulation control. Water in the micro-pilot plant underwent decontamination from all major radionuclides by decontamination factors ranging from 1000 to 10,000 for up to 2400 bed volumes of water. Product water met U. S. Public Health Service Standards for radioactive elements, and the turbidity level of .05JTU is comparable to that of high-quality distilled water. (Lowry-Texas)
W71-07767

QUALITY VERSUS RESIDUAL CHLORINE,
Public Health Service, Cincinnati, Ohio. Control Technology Branch.
For primary bibliographic entry see Field 05F.
W71-07768

MANAGEMENT DECISIONS IN SOLVING WASTE WATER PROBLEMS,
Oscar Mayer, and Co., Asilomar, Calif.
O. Donald Denker.
Water and Sewage Works, Vol 118, No 1, p IW-14--IW-22, Jan 1971. 2 fig, 7 tab.

Descriptors: *Water pollution control, Biochemical oxygen demand, Waste water treatment, Industrial wastes, Biological treatment, Water policy, *Water management (Applied), *Decision making.

Each company should adopt a water pollution control policy headed by a responsible person who has ready access to top management. At Oscar Mayer and Company the general sanitary engineer keeps the management informed by periodical status reports. Samples of such reports are presented. There are four causes for wrong management decisions which are: (1) lack of information, (2) misinformation, (3) information misused, and (4) information not used. Those four causes are discussed with illustrative examples. With environmental pollution control affecting plant site selection, a basic policy for site selection is presented with an illustrative example. Though not economical but for the sake of pollution prevention, continuous rendering processes have been used in place of wet rendering. Water conservation and reuse which could be achieved by better design of water using equipment and improving personnel attitude toward conservation should receive more attention from the management. Oscar Mayer and Company re-uses 3.2 MGD of pretreated water. Waste water stream segregation helps achieve effective pretreatment at least cost. Companies should always look into developing their own secondary treatment prior to negotiation with municipalities. A flow chart of Oscar Mayer and Company's waste treatment plant at Madison, Wisconsin which achieves 93.5% BOD removal is shown. (Rayaan-Texas)
W71-07770

BOD AND COD ANALYSES ON PARAFFINIC HYDROCARBONS,
University of Western Ontario, London. Biochemical Engineering Group.
For primary bibliographic entry see Field 05A.
W71-07772

WATER POLLUTION CONTROL AT THE ROHM AND HAAS HOUSTON PLANT,
Rohm and Haas Co., Deer Park, Tex.
J. W. Parrot, and W. M. Smith.
Water and Sewage Works, Vol 118, No 1, p IW/4-IW/8, Jan 1971. 8 fig, 4 tab.

Descriptors: *Waste water treatment, *Biologic treatment, Chemical oxygen demand, Incinerati Organic wastes, Effluents, Suspended solids, Tex Water pollution control, *Oxidation lagoo Chemical wastes, *Aeration.
Identifiers: Polymers, Compositing, *Houst (Tex).

The Houston plant of Rohm and Haas Company an organic chemical producing plant. It has e panded its treatment facilities three times in elev years. The latest of these expansions included million gallon aerated lagoons with 1500 hp floating aerators. The lagoons treat 1400 g waste water which is a complex of salt and orga compounds. A chromatogram of a typical samp shows 14 different peaks. A discussion of the CO load is presented with illustrative graphs. The tre ment facilities consist of water collection, prima facilities (oil and sludge separation, compositi neutralization) and secondary (biological) un which are illustrated in the flowsheet. Discussion the various units is presented. The aerated lagoo were selected in order to obtain relatively l suspended solids. The total capital investment waste water handling including sewer system, wa treatment plant and waste oil facilities is abo $3,300,000. The cost of waste treatment excludi depreciation is about $.014/lb of COD removal $0.53/1000 gal. of water processed. Disposal oily wastes including depreciation is $0.035 g (Rayaan-Texas)
W71-07773

LOW TEMPERATURE CATALYTIC OXIDATION OF WASTE WATER VAPORS,
Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
Courtney A. Metzger, Albert B. Hearld, Bobby J. Reynolds, Bobby G. McMullen, and William H. Thomas.
Available from the National Technical Informati Service as AD-715 286, $3.00 in paper copy, $0. in microfiche. Aerospace Medical Resear Laboratories Report No AMRL-TR-68-48. 13 p fig, 6 tab, 2 ref. Project No 6373, TASK 04.

Descriptors: *Water reuse, *Catalysts, *Oxidati *Vapor compression distillation, Urine, Evapo tion, Membranes, Filtration, Ammonia, Micro ganisms, *Waste water treatment, Temperatu Radioisotopes, Electric power demand.
Identifiers: Plate counts, Waste water vapors.

Two low temperature catalytic oxidation systen designed to oxidize waste water vapors a eliminate trace organic entrainment, were studi with regard to future application to waste wa reclamation in space. Formerly, temperatures 1200F were essential to system operation, th precluding such a system on the basis of power d mand alone. With the development of the t systems tested in this work, catalytic oxidation 300F was made possible. Development radioisotope energy for thermal energy also co tributed much towards making catalytic oxidati more feasible both from a power and a weig standpoint. Sterile, high quality water w reclaimed by the catalytic oxidation units, used conjunction with vapor-compression distillati units, and various filtering membranes. Input to t system consisted of urine, washwater, and deh midification. Output rate varied from 546 ml/hr 30 ml/hr during a ten day test. Further research needed on a long term basis to stimulate orbital space flights of extended duration. However, this the first known development of a satisfactory l temperature catalytic unit integrated with vacuum distillation recovery unit, and such a u could possibly have widespread application. (Lo ry-Texas)
W71-07774

OZONE GENERATED FROTH FOR SEWAG TREATMENT,
New Mexico State Univ., University Park. Dept. Chemical Engineering.
Joh M. Foulds, Donald B. Wilson, and John W. Clark.

er and Sewage Works, Vol 118, No 3, p 80-83, 1971. 7 fig, 3 tab, 11 ref. FWQA Grant No 1-WP-26, 288-01 and 288-01 A1.

criptors: *Foam separation, *Ozone, Laborato-ests, Metals, Sampling, Surfactants, Foaming, ation, Oxygenation, Flow rates, *Chemical ox- demand, Biochemical oxygen demand, ates, Phosphates, Biodegradation, *Waste r treatment, *Sewage treatment.

use of ozone as a possible agent for producing ble controlled foam capable of COD reduction investigated. A laboratory scale experimental tor of 5 liter capacity was assembled and moni-l. Various gas flow rates were used, and there no temperature control. COD tests were per-ed by the Jeris method, with other examina- conforming to Standard Methods. Addition of of Fe (....) and Mn (....) aided in the produc- of a stable foam which produced an 85% ction in organic nitrogen, and an 88% reduc- in total phosphates, when operated for one at a gas flow rate of 1100 ml/min. on trickling effluent. The COD reduction of approximate-% was accomplished after only 20 min. The reduction mechanism is complex, however, major reduction occurs both through chemical ation of the substrate, and through separation o internally generated frothing. (Lowry-Tex-

-07775

RMACEUTICAL WASTE WATER: RACTERISTICS AND TREATMENT,
aska Univ., Lincoln. Dept. of Civil Engineer-

Anderson, M. J. Hammer, J. G. Obrist, L. E. els, and C. D. Turner.
r and Sewage Works, Vol 118, No 3, p IW/2-, Mar 1971. 3 fig, 2 tab, 4 ref. FWQA Grant T1-WP-120-02.

riptors: *Industrial wastes, *Activated sludge, ste water treatment, Fungi, Sludge, Economic bility, Pre-treatment (Water), Waste identifi-n, Analytical techniques, Toxicity, Organic ng, Biochemical oxygen demand, Chemical en demand, Nebraska.
ifiers: *Pharmaceutical wastes, Extended ion, Treatability studies, Sugar, *Lincoln r).

orsey Laboratories pharmaceutical formula-plant in Lincoln, Nebraska, was experiencing ulty with their extended aeration treatment Operational problems included sludge bulk-xcessive solids loss from the system, and con-ation of solids in the clarifier. To determine roblem, a comprehensive study was initiated consisted of three phases: (1) an initial ation of the existing treatment system and the nt waste water characteristics; (2) an evalua-f the treatability of the wastes in an extended ion system in the laboratory under closely olled conditions; and (3) incorporation of the gs of the two preceding steps in a more ed field evaluation of the existing facilities. produced by all of the studies proved conclu- that due to the variability both of the com-on and the flow, and also the effects of certain ounds present in large quantities, the phar-utical waste produced at this plant was not able to treatment by the extended aeration nent scheme. The primary reason was the amounts of sugar in the plant waste which in-l the growth of filamentous micro-organisms pset the plant. Dilution with municipal wastes s to be the only feasible alternative, and rch is continuing along this line. (Lowry-Tex-

07776

N REDUCTION OF WASTE WATER M HOUSEHOLDS,
ral Dynamics Corp., Groton, Conn. Electric Div.
ley, and H. Wallman.

Water and Sewage Works, Vol 118, No 3, p 68-70, Mar 1971. 4 fig, 8 ref.

Descriptors: *Water conservation, *Water re-use, Waste water treatment, Domestic wastes, Technical feasibility, Cost analysis, *Water utilization, Disinfection.
Identifiers: Bathing.

Various sources were utilized to establish a water use pattern for an average American family of 2 adults and 2 children. 70% of the total household water intake is consumed in toilet flushing and bathing. Therefore, since this is the largest single area of water use, the greatest savings from applied conservation techniques should be accomplished here. Several plumbing innovations that reduce the amount of water required to transport waste products from the home are presented, as well as water-conserving devices for showers and washing machines. A cost analysis revealed, however, that water re-use within the individual home unit is not economically feasible. Water conservation, then, is important in reducing the total volume of flow which requires extensive treatment, thereby easing the burden on many overloaded treatment facilities. The following conclusions were drawn from the preceding study: (1) currently available water saving devices can reduce waste flows from 30 to 50% at little additional cost to the homeowner; (2) limited surveys indicate general public acceptance of such devices; and (3) complete waste treatment and water re-use on a single unit scale does not appear to be practical at this time. (Lowry-Texas)
W71-07777

ANAEROBIC SLUDGE DIGESTION, MESOPHILIC-THERMOPHILIC,
Western Kentucky Univ., Bowling Green.
D. R. Rowe.
Water and Sewage Works, Vol 118, No 3, p 74-76, Mar 1971. 2 fig, 1 tab, 8 ref.

Descriptors: *Anaerobic digestion, *Temperature, Methane bacteria, Microorganisms, *Sludge digestion, Alkalinity, Hydrogen ion concentration, Acidity, Nitrates, Nitrites, Ammonia, Methane, *Waste water treatment.
Identifiers: Volatile solids, Volatile acids.

Four laboratory scale anaerobic digesters were operated for a 4 week period. Two digesters were operated in thermesophilic range (35C), and two were operated in the thermophilic range (55C) to determine the temperature effects. The progress of digestion was evaluated by the volume of gas produced and by the decrease in volatile solids and the increase in fixed solids. pH, total solids, volatile solids, nitrate, nitrite, ammonia, alkalinity, and volatile acid analyses were performed on the sludge samples, and all determinations were made in accordance with Standard Methods. Overall results showed a higher rate of digestion taking place in the thermophilic digesters. Also, the thermophilic organisms were shown to be more efficient in the removal of nitrate and nitrite nitrogen. The increased efficiency of thermophilic digestion proved that satisfactory results could possibly be obtained in 7-15 days instead of the usual 24-26 days presently used in mesophilic digestion. Therefore, heating of the digesters to the thermophilic range could effectively double the digester capacity of an existing plant without additional construction. (Lowry-Texas)
W71-07778

RECLAMATION OF POTABLE WATER FROM DOMESTIC SEWAGE,
Ontario Research Foundation, Toronto.
F. Besik.
Water and Pollution Control, Vol 109, No 4, p 46-48, Apr 1971.

Descriptors: *Water re-use, *Separation techniques, Reverse osmosis, Activated carbon, Domestic wastes, Adsorption, Filtration, Ion exchange, Bacteria, Disinfection, Colloids, Chemical oxygen demand, Biochemical oxygen demand, Temperature, Odor, Taste, Color, Turbidity, Oxidation, *Waste water treatment, *Potable water, Sewage.

Production of potable water from domestic sewage must include the following steps: (1) separation of suspended and colloidal matter below 5-1 Jones Turbidity Units; (2) removal of dissolved inorganic solids to below 500 mg/l; (3) reduction of soluble organic carbon material to below 0.2 mg/l; (4) removal of toxic compounds and biocides to within the range of .001-5.0 mg/l; (5) reduction of product temperature to below 15C; (6) elimination of odors, tastes, and colors to limits acceptable to Canadian Drinking Water Standards; and (7) removal of bacterial contamination through adequate disinfection. At the present time, technology has advanced to the point where all of the above limitations can be met through the utilization of available processes. However, being technically feasible does not mean that these processes are also economically feasible at the present time. Tables included give itemized listings of the various constituents of domestic sewage, along with the per capita contribution of many common pollutants. (Lowry-Texas)
W71-07779

PAPER MILL WASTE: TREATMENT FOR COLOR REMOVAL,
Continental Can Co., Inc., Hodge, La.
Edgar L. Spruill.
Water and Sewage Works, Vol 118, No 3, p IW/15-IW/25, Mar 1971. FWQA Grant No 12040 DRY.

Descriptors: *Color, *Lignins, Pulp and paper industry, *Pulp wastes, Fibers (Plant), Turbidity, Chemical precipitation, Calcium carbonate, Lime, Sludge, Filtration, Industrial wastes, *Waste water treatment.

The Kraft pulping process separates lignin from wood cellulose and results in the production of black liquor. This black liquor is not effected by even the most thorough bio-oxidation processes. Alternative treatment methods have been studied. Lime precipitation has been given special attention because of the possibility of recovering it through the pulp mill chemical system. Several variations of lime precipitation were experimented with before the accidental discovery that water containing fiber 'fines' provided good flocculation and removal at moderate lime dosages. Experiments on a wide variety of colored process waste water showed the lime requirements to vary almost, but not quite, directly as the effluent color varied. After color precipitation, the resultant clarified liquid contained nearly half of the lime used. This liquid was reacted with CO2, from kiln stack gas to recover the calcium as calcium carbonate. Recarbonization neutralized the final effluent. The sludges were all processed through the lime kiln, the fiber-lignin sludges burned, and the remaining lime recovered. (Lowry-Texas)
W71-07780

METHODS FOR TREATING WASTES FROM WATER TREATMENT PLANTS,
Metcalf and Eddy, Inc.
Stephen L. Bishop.
Journal, New England Water Works Association, Vol 85, No 1, p 10-24, Mar 1971. 6 fig, 3 ref.

Descriptors: *Waste water treatment, *Sludge, Water treatment, New England, Water softening, Coagulation, Flocculation, Sedimentation, Chemical precipitation, Filtration, Centrifugation, Vacuum drying, Freezing, De-watering, Lime, Nutrients, Iron, Manganese, Hardness, Sewers.

The main sources of wastes from water treatment plants include: (1) filter backwash water; (2) coagulation process sludges; (3) softening sludges; (4) sludges from iron and manganese removal plants; (5) diatomaceous earth filtration sludges; and (6) ion exchange brines. For the sludge to be

disposed of in landfill areas, it must first be dewatered. The popular cut-off for dewatering processes is 20% solids and a process which cannot concentrate the sludges to 20% solids has no possibility of commercial use. The process achieving the greatest volume reduction at the present time is freezing of the sludge. This method has been successfully used in Copenhagen since 1963. Laboratories in the United States have reported volume reductions of as much as 86% after the first freezing, with further reductions possible with repeated thawing and re-freezing. Seven other possible disposal methods are; (1) lagoons; (2) drying beds; (3) direct discharge to a sanitary sewer; (4) centrifugation; (5) sludge pressing; (6) vacuum filtration; and (7) alum recovery. No one of these methods is universally applied. In each instance, the particular task to be accomplished, and the economics involved must be carefully considered before a process is selected. (Lowry-Texas)
W71-07781

DILUTION OF AN INDUSTRIAL WASTE EFFLUENT WITH RIVER WATER IN THE VADOSE REGION DURING PIT RECHARGE,
Arizona Water Resources Research Center, Tucson.
L. G. Wilson, P. S. Osborne, and D. J. Percious.
Office of Saline Water, Grant 14-01-0001-630.
American Society of Agricultural Engineers, 1968 Winter Meeting, Chicago, Illinois. Meeting Paper No 68-727. 26 p , 8 fig, 3 tab, 10 ref.

Descriptors: *Artificial recharge, *Waste dilution, *Pit recharge, *Water reuse, *Vadose water, Profiles, Potable water, Water quality, Chemical analysis, Groundwater recharge, Pollution abatement, Monitoring, Mixing, Waste disposal, Seepage, Pumping, Salinity, Dispersion, Ephemeral stream, Hydrographs, Industrial wastes, Effluent streams, Water conservation, Waste water disposal, Water management (Applied), Cooling water, Arizona, Arid lands.
Identifiers: *Dilution potential, *Recharge mounds, *Water-content profiles, Recharge trials, Santa Cruz River (Ariz).

Artificial recharge of waste water may conserve water resources in arid lands. Undiluted blowdown effluent (1000 to 2000 mg/l total dissolved solids--TDS) from industrial cooling towers supplied 15 pit recharge trials from May to August 1968 into 80-foot thick vadose alluvium. Water-content profiles and groundwater hydrographs were observed near the recharge site and the abutting ephemeral stream, the Santa Cruz River (Arizona). The water level below the stream averaged 70 feet. The total quantity of effluent recharge was 40 acre-feet. Dilution of pit-recharged effluent and residual water (700 mg/l TDS) did not occur in the vadose region prior to summer streamflow (400 mg/l TDS), though dilution ensued in downstream groundwater, and in the phraetic region. Pit-recharged effluent was not diluted with streamflow recharge because of high heads in the effluent. After trials, streamflow recharge mixed with the effluent producing lower salinities during the pumping operation. Dilution potential of influent seepage is useful in waste disposal or artificial recharge when in place mixing may replace above ground mixing facilities. Recharging of highly concentrated waters should coincide with periods of fully developed river recharge mounds and/or when ephemeral streams are discharging. Pumping as a mixing and blending procedure should be evaluated. Water-quality monitoring is necessary to avoid potable groundwater contamination. (Popkin-Arizona)
W71-07817

OZONATION, NEXT STEP TO WATER PURIFICATION,
Rene J. Bender.
Power, Vol 114, No 8, p 58-60, Aug 1970. 4 fig.

Descriptors: *Ozone, *Water purification, *Waste water treatment, Oxidation, Chlorination, Storm runoff.
Identifiers: *Overflow purification, Philadelphia.

Ozonation is an outstanding method for purifying water, because ozone is a superior oxidizing agent and oxidation helps clean water thoroughly. Workings of the two types of ozonators are diagrammed and described. Ozonation is not yet used in the U.S. to purify municipal drinking water because most state laws demand that chlorination be used. Ozonation does not replace chlorination, but it incorporates chlorine into its process in two forms. Ozonation kills bacteria and viruses faster than does chlorination; in addition, ozone does not affect water taste, and it eliminates the slight chlorine taste introduced during primary treatment. Ozonation costs about twice as much as chlorination, but both are very inexpensive. A U.S. trend is now towards ozonation of waste water, and one pilot plant in Philadelphia is designed to purify combined sewer and stormwater discharge when flash floods cause untreated water and sanitary sewage to overflow into rivers. Additional uses of ozone in connection with wastewater are mentioned.
W71-07846

FIRESTONE INSTALLS POLLUTION CONTROL.

Oil Gas J, Vol 68, No 35, p 79, Aug 31, 1970.

Descriptors: *Water pollution control, *Treatment facilities, Control systems, Concrete construction, Separation techniques.
Identifiers: *Industrial treatment, *Storm water treatment.

A water pollution control system, which separates storm and industrial effluent and treats plant waste water before release into the bayou, is being installed. This $8.8 million operation provides the Firestone plant with a separate industrial effluent collecting system and a separate storm water collecting system, thus the possibility of flushing the two systems together during a heavy rainfall is eliminated.
W71-07847

A PHYSICAL - CHEMICAL SYSTEM FOR TREATMENT OF COMBINED STORM SEWAGE.

Committee on Sewerage and Sewage Treatment, Ralph Stone (Chairman) J Sanit Eng Div, Am Soc Civil Engrs, Vol 96, No SA4, Proc Paper 7477, p 993-994, Aug 1970.

Descriptors: Water pollution control, *Sewage treatment, *Activated carbon, *Pilot plants, Laboratory tests, *Waste water treatment.
Identifiers: *Storm sewage.

This is a report on ongoing research, conducted by A. J. Shuckrow, G. W. Dawson, and A. T. Brix, covering enumeration and evaluation of the factors which should affect decisions as to the degree of water pollution control required in each specific situation. Powdered activated carbon may be utilized in a physical-chemical process for the treatment of combined storm sewage. The program involves laboratory development of the process, design and construction of a 100,000 gpd mobile pilot plant, and demonstration of the process. The process involves contacting the waste water with powdered activated carbon and subsequent coagulation with alum and a polyelectrolyte followed by high-rate tube settling. The process appears to meet the following desirable characteristics for treatment of combined storm sewage: short detention time, intermittent use with capability to tolerate widely fluctuating flows and waste water composition, small space requirements, high quality effluent, and economical operation. Based on the laboratory findings, the mobile pilot plant is being designed to fit into a standard forty-foot trailer van with the exception of the carbon regeneration facility, which will be skid mounted. The system is designed for maximum operational flexibility and includes turbidity, pH, and flow measuring instruments in addition to the continuous organic carbon analyzer.
W71-07849

PUMP INSTALLATION FOR SEWAGE.

Netherlands Patents ..NL 6817242.

Descriptors: *Patents, *Sewerage, *Pump plants, Overflow, Pipelines, Waste water treatme

This installation is especially good for pump sewage containing larger sized pieces with separation or processing. The collector feed pip connected in normal circumstances to the colle ing reservoir by a feed pipe and a pump with its sociated suction and delivery pipes. In exceptio conditions the system is connected via an overfl situated as close as possible above the feed pipe the sewage pit and consists of an overflow pi horizontally below which is fixed a grid, separated from the incoming liquid flow by a ve cal baffle wall which lies along the diameter of pit and above the feed pipe.
W71-07850

NEW EQUIPMENT--PRIMARY WAT TREATMENT AIDED BY COMPACT SEPAR TOR.
Chemical Engineering, Vol 77, No 15, p 48-50, 13, 1970. 1 diag.

Descriptors: *Pollution abatement, *Sewage tre ment, *Equipment.
Identifiers: *Waste water concentrator, *Scre separator.

The Waste water Concentrator takes up little spa but has the capacity to screen sudden overloads raw sewage (2,000-3,000 gpm) during rainfall provides standby primary treatment by screen influent and then collecting it in an annu chamber and directing it to a discharge box at bottom of the unit. Materials not passed discha through a 10-inch pipe. The workings, operat cycle, and advantages of the unit are described.
W71-07854

A REVIEW OF THE 1969 LITERATURE WASTE WATER AND WATER POLLUTI CONTROL: WASTE WATER AND STO FLOW TREATMENT.

J Water Pollution Control Fed, Vol 42, No 6 963-969, Jul 1970. 42 ref.

Descriptors: Equipment, *Construction materi *Treatment facilities, Overflow, Constructi Sewers, Technical feasibility, Sewerage, Storm noff, Separation techniques, Water pollution c trol, *Waste water treatment.
Identifiers: Treatment methods, Combined sewe

This section of the review of 1969 literat discusses the construction of new sewerage syst and improvements made in existing systems in la and small cities. New construction meth materials, and safety programs, are described al with new sewer maintenance and repair progra and methods, and equipment for handling co bined sewer overflows including rubber stor tanks, stabilization basins, regulators, treatm facilities, hydraulic additives, pressurized sew and the removal of downspout connections. feasibility of sewer separation, pollution para ters from surface runoff, sewer project planni and changes in sewer systems are other topics cluded in the literature review on waste water storm flow.
W71-07866

CONTRIBUTION TO THE THEORY OF TRI LING FILTER PERFORMANCE,
Denver Univ., Colo. Dept. of Chemical Engine ing.

/. Ross.
er Research, Vol 4, p 517-520, 1970. 3 fig, 5

criptors: *Trickling filters, *Kinetics, *Hydrau-
roperties, Equations, Mathematical models,
elation analysis, Waste water treatment.
tifiers: Michaelis-Menten kinetics.

precise definition of kinetic and hydraulic
acteristics of the trickling filter is hindered by
ences of many variables related to operation,
sphere, and microbiotic activity. The present
proposes to consider the trickling filter as a
ogeneous packed-bed reactor obeying
naelis-Menton kinetics. On these premises, the
) removal is approximately linear in the inverse
rate at high loadings. As indicated by some re-
, the BOD removal is independent of loading
w rates and the process is controlled by diffu-
(Wilde-Wisconsin)
-07877

**ORPTION OF ORGANIC COMPOUNDS
O SOLIDS FROM AQUEOUS SOLUTIONS,**
inia Polytechnic Inst., Blacksburg. Dept. of
mistry.
es P. Wrightman, Leslie R. Dole, J. Jones, and
ence A. King.
lable from the National Technical Information
ice as PB-199 267, $3.00 in paper copy, $0.95
icrofiche. Virginia Polytechnic Institute and
University Water Resources Research Center
etin 42, Feb 1971. 52 p, 12 fig, 16 tab, 14 ref,
nd. OWRR Project A-026-VA (2).

criptors: *Adsorption, *Phenols, *Plastics,
ter pollution treatment, *Water pollution con-
Water chemistry, Activated carbon, Sorption,
aces, Organic compounds, Waste water treat-
t.
tifiers: Pollutant removal.

orption of phenol from aqueous solutions on
s varying in surface energy was studied using
mers as adsorbents. The amount of phenol ad-
ed on silica, carbon, nylon, polyethlene, and
on was measured over a wide range of concen-
ons. The temperature dependence of adsorp-
was established in the case of carbon. Surface
measure measurements, infrared spectra, and
act angle measurements were used to better
e the factors effecting phenol adsorption. The
ce areas of Cab-O-Sil, Graphon, Aviamide,
hon, Microthene, and Teflon were 223, 87,
0.10, 0.35 and 8.5 sq m/gm, respectively, mea-
d by either low temperature nitrogen or kryp-
adsorption. The critical surface tensions of
othene, Alathon, and Teflon were 35, 31.5,
28 dynes/cm, respectively. The value for
on was anomalously high. The multiple internal
ction infrared spectrum of Microthene showed
adsorption bands than Alathon. No signifi-
temperature dependence was noted in the ad-
ion of phenol on carbon. The amount of
ol absorbed per unit area by the solid in-
ses as the surface energy of the solid decreases.
pp-USGS)
-07910

**IONSTRATING THE EFFECTS OF
RIENTS IN BIO-OXIDATION POND
EIVING STREAMS,**
homa Univ., Norman. Bureau of Water
urces Research.
primary bibliographic entry see Field 05C.
-07973

**IBINED SEWER OVERFLOW SEMINAR
ERS.**
ral Water Pollution Control Administration,
hington, D.C. Div. of Applied Science and
nology.
primary bibliographic entry see Field 05G.
-07978

OVERVIEW OF CONTROL METHODS,
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07979

STORAGE AND TREATMENT OF COMBINED SEWAGE AS AN ALTERNATE TO SEPARATION,
Banister Engineering Co., St. Paul, Minn.
For primary bibliographic entry see Field 05G.
W71-07980

POLYMERS FOR SEWER FLOW CONTROL,
Environmental Protection Agency, Washington, D.C., Storm and Combined Sewer Control Branch.
For primary bibliographic entry see Field 05G.
W71-07981

OVERVIEW OF TREATMENT METHODS,
Environmental Protection Agency, Washington, D.C.
Darwin R. Wright.
In: Combined Sewer Overflow Seminar Papers, p 53-58, Mar 1970. EPA Program 11020-03/70.

Descriptors: *Overflow, *Treatment, Waste water treatment, Water pollution control.
Identifiers: Combined sewers, Treatment methods.

The importance of a varying waste is emphasized in relation to the treatment of combined sewer overflows. The three different treatment methods employed are: physical treatment, biological treatment, and chemical-physical treatment. Examples of these methods are included along with discussions on their results. (See also W71-07978)
W71-07982

MICROSTRAINING WITH OZONATION OR CHLORINATION OF COMBINED SEWER OVERFLOWS,
Crane Co., King of Prussia, Pa. Cochrane Div.
For primary bibliographic entry see Field 05G.
W71-07983

OVERVIEW OF COMBINED CONTROL AND TREATMENT METHODS,
Environmental Protection Agency, Washington, D.C. Storm and Combined Sewer Pollution Control Branch.
For primary bibliographic entry see Field 05G.
W71-07985

ASSESSMENT OF ALTERNATIVE METHODS FOR CONTROL/TREATMENT OF COMBINED SEWER OVERFLOWS FOR WASHINGTON, D.C.,
Weston (Roy F.), Roslyn, N.Y.
For primary bibliographic entry see Field 05G.
W71-07986

NEW TECHNOLOGY FOR TREATMENT OF WASTE WATER BY REVERSE OSMOSIS,
Envirogenics Co., El Monte, Calif.
B. S. Fisher, and J. R. J. Lowell.
Copy available from GPO Sup Doc as EP2.10; 17020DUD 09/70, $0.70; microfiche from NTIS as PB-199 362, $0.95. EPA Report 1-66, Sep 1970. EPA Program No 17020DUD, Contract No 14-12-553.

Descriptors: *Reverse osmosis, *Separation techniques, Desalination processes, Demineralization, Semi-permeable membranes, Membranes, Cellulose, Phosphates, Nitrates, Temperature, Chemical oxygen demand, Pressure, Tertiary treatment, *Waste water treatment.
Identifiers: *Flux, Total dissolved solids.

Stable, high-flux membranes for waste water renovation by reverse osmosis were required to meet or exceed: (1) fluxes greater than 60 gal/sq ft/day with no more than a 20% increase after one year; (2) rejection of 60% of sodium chloride; and (3) rejection of 90% of sodium sulfate. All testing was performed at 600 psi, with 1000 ppm feed solutions. These specifications were met by three cellulose based membranes. Flux losses over short periods were extrapolated to yearly values and ranged from 12-18%. However, periodic cleaning with a laundry enzyme pre-soak was necessary as the flux rates initially declined very rapidly. Cleaning restored the membranes to 80 to 90% of the initial values. Daily cleaning maintained a five day series of tests at nearly constant levels. The best of the three membranes tested rejected 90 to 97% of TDS, 70 to 100% of COD, 86 to 96% of ammonium ion, 72 to 99% of nitrate ion, and 97 to 99% of total phosphate. Techniques were explored for attachment of proteolytic enzymes to cellulose acetate membranes to render them resistant to colloid fouling. The proteolytic enzyme trypsin was chemically attached to the active layer surface of a membrane prepared from the N-hydroxysuccinimide ester of cellulose acetate hydrogen succinate. The resulting enzymatic membrane displayed hydrolytic activity. No cost estimates were presented for this type of treatment process. (Lowry-Texas)
W71-07990

PHOSPHATE STUDY AT THE BALTIMORE BACK RIVER WASTE WATER TREATMENT PLANT.
City of Baltimore, Md.

Copy available from GPO Sup Doc as EP2.10; 12010DFV 09/70, $1.50; microfiche from NTIS as PB-199 363, $0.95. EPA Report, Sep 1970. 158 p, 16 tab, 33 fig, 14 ref. EPA Program No 12010DFV, Contract No 14-12-471.

Descriptors: *Phosphates, *Activated sludge, Automatic control, Design criteria, Monitoring, Analytical techniques, Sampling, Hydrogen ion concentration, Turbidity, Nitrogen, Chemical oxygen demand, Dissolved oxygen, Oxidation reduction potential, Data processing, Baffles, Aeration, Mixing, Chemical precipitation, Municipal wastes, *Waste water treatment.
Identifiers: Baltimore (Md).

High levels of phosphorus removal have been observed at the Baltimore Sewage Plant in the past. A six month study of the operating conditions and design parameters of two parallel, 10 MGD activated sludge systems was conducted in an attempt to establish the mechanism by which the phosphate was removed. The following variables were used: suspended solids concentration, waste water flow, aeration basin mixing configuration, and dissolved oxygen levels. Both mixing and dissolved oxygen were shown to influence the process greatly. Contact stabilization or step aeration, as opposed to plug flow, caused sharp decreases in the removals, while low dissolved oxygen levels stimulated releases of phosphorus from the sludge. Operating conditions which enhance phosphate removal are standard conditions now at the Baltimore plant. Phosphate removal at Baltimore averaged 82%, compared with 15 to 20% removals for conventional activated sludge, and 9% in Baltimore's trickling filter. No costs analysis was undertaken, since complete removal of the phosphorus involves removal from the sludge supernatant. Some of the parameters which may lead to enhanced phosphate removals have been demonstrated. However, the exact reaction or mechanism by which the removals proceed is still unknown, even though it was established that the calcium removed from the system was not principally by precipitation. (Lowry-Texas)
W71-07991

THE BACTERICIDAL EFFECT OF LIME FLOCCULATION/FLOTATION AS A PRIMARY UNIT PROCESS IN A MULTIPLE SYSTEM FOR

THE ADVANCED PURIFICATION OF SEWAGE WORKS EFFLUENT,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, Nora A. Grabow, and J. S. Burger.
Water Research, 1969, Vol 3, p 943-953. 6 fig, 1 tab, 25 ref.

Descriptors: *Disinfection, *Bactericide, Hydrogen ion concentration, Alkalinity, Lime, Flotation, Flocculation, Coagulation, Water re-use, Temperature, Analytical techniques, Separation techniques, Sampling, Bacteria, E. Coli, *Waste water treatment.
Identifiers: *Plate counts.

To determine the bactericidal effect of lime in the flocculation/flotation unit under investigation, survival times were recorded for: (1) pure cultures of selected bacterial strains exposed to lime in membrane-filtered humus tank effluent (HTE); (2) the bacterial population naturally occurring in HTE exposed to lime in raw HTE; and (3) the bacterial population naturally occurring in HTE exposed to lime in the flotation unit. Reductions occurring in the reactor itself are attributed both to the bactericidal action of lime, and physical removal in coagulation and flocculation. Bacterial reductions of as high as 98% were recorded. Although coliform organisms were reduced 98%, faecal streptococci and staphylococci were reduced only 95.0 and 93.3% respectively under the same conditions. Maintaining the pH at 11.5 for 60 minutes reduced the plate count of the normal mixed culture by 99.0%. Factors affecting the effects of the flotation unit include: (1) presence of organic material; (2) the physiological state of naturally occuring bacteria differs from that of organisms grown in 24 hour broth cultures; (3) temperature increases directly increase the bactericidal effect of the lime; and (4) structure of the bacterial cell wall seems to influence the amount of reduction. In an actual treatment situation, the Lime Flotation/Flocculation will provide not only particulate removal, but high alkalinity will reduce bacterial levels as well. (Lowry-Texas)
W71-07992

THE VIROLOGY OF WASTE WATER TREATMENT,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow.
Water Research, 1968, Vol 2, p 675-701. 147 ref.

Descriptors: *Public health, *Viruses, *Waste water treatment, Epidemiology, Activated sludge, Filtration, Adsorption, Hydrogen ion concentration, Temperature, Flotation, Disinfection, Viricides, Ozone, Chlorination, Oxidation, Ultraviolet radiation, Environmental sanitation.
Identifiers: South Africa.

Virology has just recently been endowed with the tools necessary to conduct epidemiological investigations. Within the last 30 years, the development of the electron microscope and of tissue culturing techniques have stimulated interest and concern in the transmission of viruses. Sampling procedures and isolation techniques are presented as background for examining the virology of waste water treatment plants. Examinations have revealed that little or no virus removal takes place in primary settling tanks with detention times of 3 hours or less. Flocculation could possibly concentrate the viruses in the floc, but although as much as 99.6% virus removal has been observed in the laboratory, operating conditions in most plants would preclude efficiencies in that range. Little information has been compiled with regard to viral removals in trickling filters, but the information that is available indicates that little or no removal takes place. Activated sludge data, however, indicates significant antiviral activity, with up to 98% reduction of certain coxsackie viruses. Stabilization ponds and activated carbon demonstrated little effect on viruses, while sand filtration, for many reasons still unknown, removed nearly all viruses from an inflow of 20,000 PFU/ml during a 7 month investigation. Disinfection with chlorine, iodine, ozone, and ultraviolet radiation was also investigated, with ultraviolet radiation being technically, if not economically, feasible for the job. Viruses are becoming more important in our environment, and much further research is needed for their control. (Lowry-Texas)
W71-07993

MIDDLE LEE SETS THE STANDARD,
For primary bibliographic entry see Field 05G.
W71-07995

WASTE WATER TREATMENT IN GREAT BRITAIN,
Commonwealth Associates, Jackson, Mich.
Robert J. Grant.
Water and Sewage Works, Vol 117, No 8, p 266-270, Aug 1970. 3 fig, 8 ref.

Descriptors: *Water quality control, *Waste water treatment, Domestic wastes, Industrial wastes, Sewage treatment, Tertiary treatment, Activated sludge, Trickling filters, Filtration, Flocculation, Adsorption, Ion exchange, Reverse osmosis, Nutrients, Sludge, Dewatering, Centrifugation, Incineration, Organic loading, Cost analysis, Storm runoff, Climatic conditions.
Identifiers: *Great Britain.

65% of the domestic sewage of Great Britain is treated and discharged to inland water courses, while the remaining 35% is discharged directly to estuaries or the sea, receiving little or no treatment. Analytical tests performed are those recommended in 'Standard Methods', with few exceptions. Waste water constituents of Britain's domestic sewage differ from those of the United States, because of the difference in diet. Activated sludge, Pasveer oxidation ditches, and low rate trickling filters comprise the bulk of the widely accepted secondary treatment methods. Tertiary treatment methods include microstraining, slow and rapid gravity sand filtration, land irrigation, lagooning and upflow pebble bed clarfiers, while flocculation, foaming, adsorption, reverse osmosis, and electrolysis are in the experimental stage. Sludge treatment has traditionally been accomplished with drying beds. Lack of land has stimulated much interest in mechanical dewatering devices, namely pressure or vacuum filtration, polyelectrolyte conditioning, heat treatment, and wet oxidation, and incineration. Problems associated with waste water treatment are not experiencing the same rapid solutions as other technological problems. More effective control and reclamation practices are needed to avoid serious environmental problems, and progress which has been slow up to now must begin to speed up if the environment is to be saved. (Lowry-Texas)
W71-07996

A SOLUTION TO THE PHENOLIC PROBLEM IN FIBERGLASS PLANTS,
Johns-Manville Research and Engineering Center, Manville, N.J.
J. M. Baloga, F. B. Hutto, Jr., and E. I. Merrill.
Water and Sewage Works, Vol 118, No 3, p IW/7-IW/11, Mar 1971. FWQA Grant No WPRD87-01-68.

Descriptors: *Water reuse, *Phenols, Industrial wastes, Flow rate, Turbidity, Toxicity, *Filtration, Separation techniques, Hydrogen ion concentration, *Waste water treatment, New Jersey.
Identifiers: *Fiberglass, Suspended solids.

Phenolic resin is used as a binder in the manufacture of fiberglass. Conveyor belts must be flushed with water to prevent this phenolic resin from rendering them inoperable. From this washing operation, 80% of all phenol discharges are originated. The Johns-Manville Co. has developed a process for eliminating phenolic discharges by reusing phenolic wastes in the plant after filteri them to remove the suspended solids which wou otherwise foul the equipment. A small-scale test the filtration system was conducted. The syste consists of a scrap pump, a primary filter, a diatomite pressure filters. Flow rate to the filters 75 ppm with influent turbidity of 12 mg/l. Efflue turbidity is reduced to 1 to 2 mg/l, eliminating t possibility of the solids fouling equipment duri subsequent reuse. Quality of the receiving wat has dramatically improved, while water use for t plant has been reduced more than 50%. Produ quality has not been impaired by reusing the f tered process waters. Net cost savings $2700/month have been realized over a 4 mon period, attributed mainly to reduction of bind usage by the amount which is recirculated in the f tered water. (Lowry-Texas)
W71-07997

METROPOLITAN BOSTON'S WASTE WATE QUALITY CONTROL PROGRAM,
Massachusetts Metropolitan District Commissio Boston.
Francis T. Bergin.
Water and Sewage Works, Vol 117, No 9, p 30 304, Sept 1970.

Descriptors: *Water quality control, *Sewa treatment, Sewers, Tunnels, Design criteria, Se mentation, Chlorination, Disinfection, Sludg Scum, Methane, Anaerobic digestion, Incinerati Massachusetts, *Waste water treatment.
Identifiers: *Boston (Mass).

The early 1900's saw the city of Boston in a po tion of leadership in the waste water manageme area. Failure to keep enlarging their facilities response to population growth, however, generat unsanitary conditions which resulted in Bost Harbor becoming a large, unhealthy cesspool the early 1950's. Today, almost twenty years aft being ordered to undertake a multi-million doll pollution control program, Boston has two tre ment plants, one at Deer Island and one at N Island, have a combined capacity of 1036 mg These plants provide only primary treatment, wi supernatant from the sedimentation basins rece ing chlorine before being released on the outgoi tide. Sludge and scum are removed, concentrate and digested in floating cover, closed digeste Digester gas produced is used as a power source the plant for the pumps and aeration blowers. T second phase of the waste water management pl includes the construction of numerous rel sewers, and of several deep tunnels. The sew bring collected waste water to the tunnels where is screened and degritted prior to discharge to t downtake tunnels. Relief sewers vary in size fr 27 in to 135 in, with approximately 11 miles of 10 to 10.5 ft diameter tunnels to collect flow from t relief sewers and convey it to one of the treatme plants. A 233 mgd storm detention and chlorin tion tank with an expected usage of 22 times yea has been included to prevent untreated by-pass The construction of this sewerage system has lowed re-opening of beaches, shellfish, harvesti bed and recreational areas. Much has been acco plished, but much remains to be done. (Lowry-Te as)
W71-07998

BIOLOGICAL TREATMENT OF BLEAC PLANT WASTES,
Prince George Pulp and Paper Ltd. (British Colu bia).
G. E. Charles, and G. Decker.
Journal Water Pollution Control Federation, V 42, No 10, p 1725-1739, Oct 1970. 5 fig, 6 tab, ref.

Descriptors: Pulp and paper industry, *Industr wastes, Water quality control, Salmon, Toxici Design criteria, Activated sludge, Neutralizatio Oxygenation, Temperature, Hydrogen ion conce tration, Biochemical oxygen demand, Aeratio Dissolved oxygen, Nutrients, Phosphates, A

ia, Lime Slurries, Cost analysis, *Biological tment, *Pulp wastes, *Waste water treatment.
tifiers: *Bleach plant wastes, Seeding, Fraser er, BOD5, Canada.

ada's Fraser River is a major salmon producing ershed. When several pulp and paper mills were t, effluent standards were immediately set ch included: (1) an aerated basin of 5 day re- ion time; (2) 60% BOD5 removal; (3) max- m effluent BOD5 of 80 mgl, and (4) effluent ed to 65% concentration with river water shall cause mortality to yearling salmon in a 96 hour od. A low-rate activated sludge treatment em consisting of neutralizing, seeding, and ting was chosen for bleach plant wastes, with combined system having a detention time of 24 s. A two year study indicated that both BOD toxicity levels were within the stipulated limits the exception of several periods of upset of the em. Unscheduled shut downs were found to ease the load on the system enough to upset peration after loading resumed. This problem solved by the addition of ammonium phate to the system at a reduced rate. Nutrient tions were alos found to be necessary, with the of BOD5 removed to nitrogen to phosphorus 00 to 5 to 1 found to achieve the best results. A residual of 0.5 mg/l was maintained at all s to facilitate biological treatment. The treat- t costs for the system averaged $1.40/ton of uct, the bulk of which goes toward neutraliza- and nutrient addition. (Lowry-Texas)
-07999

TUDY OF THE BIOLOGICAL TREATMENT EGETABLE TANNERY WASTES,
t Virginia Univ., Morgantown. Water Research

Venilal Kalyani.
er's Thesis, West Virginia University, 1970. 93 fig, 19 tab, 34 ref.

riptors: *Industrial wastes, *Color, egradation, Bacteria, Acclimatization, Ad- ion, Chemical precipitation, Aeration, iration, Hydrogen ion concentration, Colloids, ste water treatment, West Virginia, *Biologi- catment.
ifiers: *Tannins, *Polymerization, Substrate, l organic carbon, Matrices, Floc, Frank, Par-

tch fed biological reactor, using sludge previ- acclimated, was used to study the egradability of chestnut, wattle, and racho tannins. Warburg experiments showed hibitory effects for tannins in concentrations to 1.5% at pH 7.5. At pH 5.5, however, in- ory effects were detected at concentrations e 1.25% for non-acclimated sludges. Warburg riments also established the fact that during ration, the organisms utilized non-tannin car- as substrate, and not the tannins themselves. ins, as measured by shake-culture experi- s and Warburg experiments, are not movable. Decreases in concentration of tan- in a biological reactor are attributed to three rs: (1) quinone polymerization due to autoox- n; (2) adsorption onto the biological floc; and recipitation. Biological activity has no effect the color of any of the three tannins tested. tnut tannin, containing 42% bio-removable n, has the maximum bio-removable carbon, wattle and quebracho following in that order. ever, since tannins are not biodegradable, vals in a biological system must be accounted y adsorption on the surface of the floc matrix. ry-Texas)
-08000

MANAGEMENT ATTITUDE TOWARDS ER CONSERVATION,
Canada Ltd., Corunna (Ontario).
rimary bibliographic entry see Field 05G.
-08001

FROM PROBLEM TO SOLUTION WITH ABS POLYMER WASTE WATER,
Borg-Warner Chemicals and Plastics Group, Washington, W. Va.
D. M. Robinson, and Dennis R. Bolten.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 11-29, June 7-10, 1970. 9 ref.

Descriptors: *Industrial wastes, Chemical wastes, *Plastics, Sampling, Pilot plants, Design criteria, Activated sludge, Aeration, Sludge, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Analytical techniques, Engineering education, Personnel, *Waste water treatment, *Alkylbenzene sulfonates, West Virginia.
Identifiers: Extended aeration, Treatability studies.

Acrylonitrile-Butadiene-Styrene (ABS) plastics were first introduced in 1948, and were developed and marketed in the late 1950's by Marbon Chemical Division at the Borg-Warner Corp. The manufacturing plants were originally built with facilities for solids removal and pH control. When it became evident that secondary treatment was imperative, a comprehensive sampling program was initiated to monitor: (1) pH; (2) free and total acidity; (3) chlorides; (4) sulfates, (5) suspended, dissolved, and total solids; (6) BOD; and (7) COD. This sampling program was the first step in a four step plan which also included: (1) determination of biodegradability; (2) bench and pilot scale studies to supply information for secondary system process design and (3) preparation of process design. A pilot plant having an aeration basin of 10,000 gallon capacity was operated to supplement lab scale data in developing design equations. The plant was then designed according to these design equations, and has been operating satisfactorily. From this work, two important conclusions were drawn: (1) close co-operation with regulatory agencies benefits both parties; and (2) proper consideration must be given to the education of all operating personnel with regard to environmental protection. (Lowry-Texas)
W71-08002

TREATMENT OF DISTILLERY WASTES-A CASE HISTORY,
Corby Distilleries Ltd., Corbyville (Ontario).
F. H. Bellstedt, and R. K. Nethercott.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 30-41, June 7-10, 1970.

Descriptors: *Industrial waste, *Activated sludge, Aeration, Sludge, Toxicity, Copper, Hydrogen ion concentration, Lime, Fermentation, Chemical oxygen demand, Biochemical oxygen demand, Nutrients, *Waste water treatment.
Identifiers: *Distillery wastes, *Shock loading, Canada.

The distillation of various grain mashes at Corby Distilleries produced effluents from several sources. These effluents, some of which were concentrates of the original effluent, averaged 600 ppm BOD, 900 ppm COD, 11 ppm nitrogen, and 2.7 ppm of phosphates. The wastes had a pH of 3.5-4.0, but after neutralization, the wastes were found to be amenable to activated sludge biological treatment. After further laboratory and pilot plant analyses, including tests dealing with the presence of copper in the waste water, the treatment plant was designed to include the following: (1) a cooling tower for clean hot wastes handling up to 1170 Imperial Gallons per minute; (2) a cooling and recycling station for polluted hot wastes sized for 700 IGPM; (3) a second station equipped with a sump having an agitator, pH controlled lime feed, and nutrient feed pumps; (4) an aeration basin sized for 200,000 IGPD, 24 hour detention time, and with 2 mechanical aerators transferring 83 lbs O2/hr; (5) a rectangular clarifier; (6) a 4 ft deep, 1.02 surface acre lagoon providing a 5 day detention time. This system consistently produces an effluent between 30 and 60 ppm COD, 10 ppm BOD or less, and requires no pH adjustment through the plant, and only 11 ppm nitrogen and 2 ppm of potash for nutriential adjustment. The plant provides a good quality of effluent and shows good resilience in periods of overloading. (Lowry-Texas)
W71-08003

CONSERVATION, RECLAMATION AND REUSE OF SOLIDS AND WATER IN POTATO PROCESSING,
Manitoba Univ., Winnipeg.
For primary bibliographic entry see Field 05G.
W71-08004

REVERSE OSMOSIS-A REVIEW OF ITS APPLICATIONS TO WASTE TREATMENT,
Ontario Research Foundation, Sheridan Park.
A. Golomb, and F. Besik.
Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 67-96, June 7-10, 1970. 22 fig, 22 ref.

Descriptors: *Reverse osmosis, *Separation techniques, Water purification, Permeability, *Membranes, Water reuse, Desalination, Industrial wastes, Chemical wastes, Mine drainage, *Waste water treatment, Membrane processes.
Identifiers: Ultrafiltration, Flux, Power requirements.

Reverse osmosis membrane systems are currently classified in 5 major categories: (1) tubular units; (2) spiral-wound units, (3) plate and frame reverse osmosis units; (4) plate and frame ultrafiltration units; and (5) hollow fibre units. A brief description of each type of unit is presented along with its advantages and disadvantages. Reverse osmosis (and/or ultrafiltration units) have been successfully applied in the treatment of: (1) spent liquors from the pulping industry; (2) acid mine drainage waters; (3) petrochemical complex waste waters; (4) electroplating waste waters; (5) cheese whey waste streams; (6) corn processing effluents; (7) high salinty irrigation return flows; and (8) various other miscellaneous industrial waste treatment applications. The principal advantages of reverse osmosis units lie in the low power or fuel costs, as opposed to distillation. Continuing research in this area should inevitably result in better membrane materials and decreased cost, making possible the addition of even more areas to the ever growing list of areas of application. (Lowry-Texas)
W71-08006

A NOVEL ION EXCHANGE PROCESS FOR CHEMICAL RECOVERY AND POLLUTION ABATEMENT,
Ontario Paper Co., Ltd., Thorold.
D. Craig, and C. D. Logan.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 98-108, June 7-10, 1970. 3 fig, 4 ref.

Descriptors: *Industrial wastes, *Pulp and paper industry, Separation techniques, *Water reuse, Ion exchange, Resins, Adsorption, Chemical precipitation, Sedimentation, Fermentation, Alcohols, Acids, Automatic control, Chemical wastes, *Waste water treatment.
Identifiers: Sodium hydroxide, Regeneration.

The Ontario Paper Company, Limited has used recovery methods to reduce the amount of pollutants discharged from heir pulping processes. In 1943, they pioneered the production of ethyl alcohol from spent sulfite liquors in North America, and today remove in excess of 25 tons of fermentable sugars/day. In 1952, vanillin productionas begun in order to utilize the lignin present in process wastes. At present, the company is involved in a three phase development program to reduce suspended and dissolved solids in the effluent. These three steps include: (1) a 105 inch diameter settler removing 11 tons of suspended solids per day; (2) an ion exchange process; and (3) construction for evaporation and burning of the effluents. Total cost of the project is $8.6 million.

The ion exchange process involves 4 steps: (1) adsorption of alkaline vanillin process liquor in an upflow ion exchange bed at Amberlite IRC-50; (2) water washing of the resin to free it of the liquor; (3) regeneration of the resin with sodium bisulphite and sulphurous acid to elute the Na and restore the resin to its hydrogen form; (4) water washing to displace the regenerant. The three column system is totally automatic, and it can recover 30 ions/day of equivalent NaOH for subsequent in-plant reuse. Additional capacity for up to 65 tons/day recovery is available in response to increased demand. (Lowry-Texas)
W71-08007

APPLICATION OF AUTOMATIC SAMPLING TO TODAY'S WATER QUALITY CONTROL PROGRAMS,
Gurnhamand Associates, Inc. Chicago, Ill.
For primary bibliographic entry see Field 05G.
W71-08008

MINEWATER TREATMENT-INCO SUDBURY DISTRICT OPERATIONS,
International Nickel Co., of Canada Ltd., Toronto (Ontario).
C. Ferguson, and M. Morris.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 119-132, June 7-10, 1970. 10 fig, 3 ref.

Descriptors: *Acid mine water, *Sulfides, *Mine drainage, Leaching, Chemical precipitation, Lime, Sedimentation, Baffles, Sludge, Copper, Iron, Ponds, Water pollution control, Nickel, *Waste water treatment, Standards.
Identifiers: Water quality standards, Sudbury (Ontario), Canada.

The International Nickel Company has 9 operating mines, four concentrators, two smelters, an iron ore recovery plant, and a copper refinery in the Sudbury area. The output of these mines is 95,000 tons per operating day. Waters contacting the orebody leach out base metal sulphides, primarily copper, nickel, and iron, resulting in acid mine water. Criteria for discharge of mine water is 1 mg/l, 1 mg/l, and 17 mg/l of copper, nickel, and iron, respectively, with a pH to range from 5.5 to 10.6. To produce water consistent with the standards set by the Ontario Water Resources Commission, various treatment schemes have been developed and tested. The advent of hydraulically placed cemented backfills solved many settling problems, but produced sludge handling problems as well due to a greater volume of sludge. Chemical treatment was also required to reduce the dissolved metals in solution to acceptable levels. The final design used was either in series or in parallel to provide detention times from 10 to 20 days. With 10 day detention time, and an addition of 1200 lbs/day of lime, the content of nickel was reduced from 40 to 50 mg/l to less than 1 mg/l, with copper and iron being low in concentration before treatment. At present, research is continuing in the field of underflow disposal. Attempts are being made to overcome the handling problems that prevent this high grade material from yielding a direct profit return. (Lowry-Texas)
W71-08009

DEEP BED FILTRATION OF STEEL MILL EFFLUENTS,
Dravo Corp., Pittsburgh, Pa.
E. S. Savage.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 133-156, June 7-10, 1970. 9 fig.

Descriptors: *Separation techniques, *Filtration, Industrial wastes, Oil, Iron, Hydrogen ion concentration, Automatic control, Baffles, Pressure, Headloss, Water reuse, Particle shape, Particle size, *Waste water treatment, *Steel.
Identifiers: *Deep bed filtration, Millscale, Solids loading, Filter media, Backwashing, Bed expansion.

Deep bed filtration utilizes the entire bed of the filter for solids separation, with solids removal taking place at the voids of the media and not at the media surface. The actual removal mechanisms are not clearly understood, but they seem to be a combination of surface forces, gravity, interception, hydrodynamics, and several others. Since removal occurs within the bed, backwashing arrangements are of great importance in determining the final water quality. Dravo Corporation has successfully utilized deep bed filtration in the final treatment of mill scale and oily waters from steel mill hot rolling systems. Specific loading of 5 to 10 lbs of solids per square foot of filter area are commonly used in mill scale filtration and loading from 1 to 5 lbs solids/ft sq. are common for sewage effluent polishing and process water filtration. Design has commonly proceeded by the rule of thumb method with consequent expensive over-design. Increased understanding of the mechanisms involved, along with pilot scale data allow more optimization of fullscale systems at considerable savings to the industry and with no sacrifice of effluent quality. A case history is presented to substantiate the optimization techniques. (Lowry-Texas)
W71-08010

BIOLOGICAL SURVEY OF THE EFFECTS OF URANIUM MILLING WASTES ON THE WATER QUALITY OF THE SERPENT RIVER BASIN,
Ontario Water Resources Commission, Toronto.
N. Conroy.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 157-178, June 7-10, 1970. 8 fig, 8 tab, 8 ref.

Descriptors: *Acid mine water, *Industrial wastes, Fish, Zooplankton, Chemical precipitation, Neutralization, Ion exchange, *Sampling, *Monitoring, Analytical techniques, Hardness (Water), Alkalinity, Acidity, Hydrogen ion concentration, Lime, Water quality control, Water pollution sources.
Identifiers: *Organic carbon, Dissolved solids, Canada.

Effluents from uranium mines containing acidic compounds have lowered the pH and alkalinity of several lakes in Canada. This lower pH has caused a decrease in the inorganic carbon content of the lake waters, and a corresponding decrease in the planktonic life of the lakes. This decrease in plankton has caused a decrease in game fish which has retarded recreational use of the waters. The preceding conclusions were arrived at by the Ontario Water Resources Commission after three years of observing, sampling, and analyzing the biota of Lakes Quirke, Whiskey, Pecors, Elliot, Dunlop, and Teasdale. No statements were released regarding radioactivity levels until their contribution was thoroughly assessed. The following recommendations emanated from the preceding study: (1) tailings effluents should have pH between 6.8 and 8.0 at point of entrance to receiving waters: (2) automatic monitoring devices for measurement of pH and both dissolved and suspended solids should be required to insure compliance with OWRC standards; (3) the mining industry should investigate methods of restoring the affected lakes to their original pH condition; and (4) the following standards for discharge of mine wastes to poorly buffered waters should be observed, a pH of 6.8 to 8.0, less than 20 ppm sulfates, 1 ppm nitrates, 25 ppm total hardness and 75 ppm total dissolved solids. (Lowry-Texas)
W71-08011

A PRACTICAL APPROACH TO THE FILTRATION OF METAL HYDROXIDES,
Northern Electric Co., Ltd., London (England).
R. S. Cuthbertson, and E. B. Hettwer.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 178-193, June 7-10, 1970.

Descriptors: *Separation techniques, *Filtration, Chemical wastes, Industrial wastes, Flocculation, Sedimentation, Oxidation-reduction potential, O
idation, Toxicity, Acidity, Hydrogen ion concen
tion, Neutralization, Corrosion, Polyelectrol
Stainless steel, Sludge, Cost analysis, *Waste w
treatment.
Identifiers: *Plating wastes, Cyanides, Suspen
solids, London, Ontario, Canada, Polyelectrolyt

Northern Electric Co. produces telephone set p
plated with copper, nickel, chrome, zinc, tin, g
and silver. Plating wastes include all these me
plus cyanide, chromic acid, and hot mineral ac
Standard chemical precipitations are used
remove the heavy metal and their salts, but h
suspended solids concentrations prevent di
discharge of the effluent to a receiving wate
pressure filtration unit designed for a loading of
gpm/ft sq. and using a 1200 gallon pre-coat tan
150 gpm, 50 psi head pre-coat pump and a 300
lon body feed tank and 350 ft sq of filter area
constructed. The system was a total failure b
from operational and financial standpoint. A
consulting other producers about treatment of p
ing wastes, and engaging a consultant, the follow
modifications were developed: (1) filter septum
dacron were changed to stainless steel mesh;
asbestos fibres were used as pre-coat becaus
ease of maintenance; (3) flow was regulated f
4-50 gpm; (4) a stand-by sedimentation tank
constructed to allow as much as 60% of flow to
tle by gravity and by-pass the filter; (5) polye
trolyte flocculant aid was added to facili
settling. Costs for this system are estimated
$77/week, which, based on a 300,000 gallon flo
$.23/1000 gallon of effluent with a dry slu
production of 1 ton of solids. Future work is to
directed toward enlarging the settling tank fo
creased detention time, and increased sludge h
ing facilities are also planned. (Lowry-Texas)
W71-08012

**CHRYSLER CANADA LTD. INDUSTR
WASTE TREATMENT PLANT, WINDSOR,
TARIO,**
Chrysler Canada Ltd., Windsor (Ontario).
D. O. Osmun.
Ontario Industrial Waste Conference, 1
Niagara Falls, Ontario, p 194-213, June 7
1970. 4 ref.

Descriptors: *Oil wastes, Sedimentation, Flotat
Neutralization, Flocculation, Incineration,
kalinity, Acidity, Hydrogen ion concentration,
rosion, Cost analysis, Sludge, Sampling, Analyt
techniques, *Chemical wastes, *Industrial wa
Waste water treatment, *Treatment facilities.
Identifiers: Canada.

Expansion of the Chrysler Canada Ltd., Wind
Ontario plant necessitated the development
waste water treatment facility. The preliminary
dies on the problem were conducted by a con
ing engineering firm. The plant was designed
built at a total cost of $3,140,000, and close su
vision of detail was provided by Chrysler Can
Ltd in an effort to keep costs down without sacr
ing plant efficiency or capacity. A three s
system was developed to treat effluents contai
welding coolants, acid washwater, phosphate
caustic dip, anti-freeze, gasoline, emulsi
cleaners, paints, free and soluble oils, and h
suspended solids. Stage one consists of 4 h
clarifier tanks utilizing sulfuric acid to break
the oil. The resultant solids are then settled,
tered, and trucked to a municipal landfill. S
two involves removal of suspended solids by ch
cal reaction and air flotation. The floated flo
removed by skimming, concentrated, and
cinerated. Stage three is a solids contact clar
employing alum and coagulant aid to form a slu
and lime or caustic soda to control pH. P
capacity is rated at 2,200,000 gallons on a 16 h
day which can be increased to 3,000,000 gallon
running 24 hours/day. All sludge waste mate
with the exception of grit and heavy solids ar
cinerated. Chemical cost averages 15 cents to
cents/1000 gallons. Sampling on influent and
fluent is automatic, and all samples are analy

(1) SS; (2) oils, (3) pH, (4) settling rate, (5) al-
nity; (6) temperature, (7) other chemicals if
ected. Water which does not meet effluent
irements is stored and treated again. (Lowry-
as)
-08013

**RATIONAL GROWING PAINS OF AN IN-
TRIAL WASTE TREATMENT PLANT,**
A Corp., Ltd., Midland (Ontario).
. Cox.
eedings, Ontario Industrial Waste Conference,
, Niagara Falls, Ontario, p 214-222, June 7-10,
).

criptors: *Chemical wastes, *Industrial wastes,
ste water treatment, Automatic control,
pling, Hydrogen ion concentration, Acidity,
linity, Chromium, Toxicity, Diatomaceous
n, Filtration, Sedimentation, Demineralization,
tralization, Lagoons, Pumps, Stainless steel,
ntenance, Personnel, Cost analysis, *Treat-
t facilities.
tifiers: *Suspended solids, Canada.

RCA Ltd. plant at Midland, Ontario is situated
highly scenic recreational area where pollution
rol of both air and water is essential. The plant
luces only color television picture tubes. Ef-
nts from the plant contain mostly acid and al-
wash and rinse waters. The sewers are broken
n into categories: (1) sanitary sewers con-
ed to the town of Midland sewerage system;
clear water drains for roof drains and untreated
ing waters; (3) caustic drains; and (4) saran-
l steel pipe acid drains. The treatment system
ists of holding tanks, chrome reduction tanks,
ralization tanks, three diatomaceous earth
sure filters, and storage lagoons. The problems
lved with the start up, and the continued
ation of the plant are discussed along with the
edial action taken. Problems ranged from those
ciated with overflow caused by undersized
to those stemming from laundry shrinking of
on filter bags. 50 million U. S. Gallons were
ted in 1969 at a total cost including depreciа-
and overhead of about $1.40 per thousand gal-
. Operational improvements and increased
n plant load are expected to reduce the cost to
ewhere around $1.00/1000 gallons in the near
re. (Lowry-Texas)
-08014

**OT PLANT STUDIES ON COMBINED
MESTIC AND PAPER MILL WASTES,**
rien and Gere, Syracuse, N.Y.
J. Keegan.
rio Industrial Waste Conference, 15th, p 78-
une 1968. 8 fig, 4 tab.

criptors: *Biochemical oxygen demand,
mestic wastes, Pilot plant, Design, Pulp and
r industry, Economics, Activated sludge, Sta-
ation, Effluent standards, Pulp wastes, *Waste
r treatment.
tifiers: *Suspended solids, Press effluent.

ew York law calling for 85% BOD and SS
oval from all effluents brought about a joint
e water treatment study. A pilot plant was con-
cted to determine process design parameters
he treatment of combined domestic and paper
wastes in the city of Plattsburgh. The study was
o steps, the first was a feasibility and economic
y and the second was the pilot plant. Prelimina-
udy and site limitations determined the use of
activated sludge process. Discharge from mill
2 (press effluent) which is only 1% of the total
but contains 50% of the organic load
ented a special problem. Design was made so
plant will operate both with or without the press
ent. Conventional activated sludge was used
he contact stabilization modification was eval-
d because of possible savings on the volume of
aeration tank. Results from the conventional
ess indicated that an excess of 90% BOD
oval can be achieved with loading on the aera-
tion tank below .7 lb BOD/No. MLSS. Results from the modified process indicated that 92% BOD removal from all sources could be obtained at 3 hour contact time and 3 hours stabilization time which indicates no significant economic advantage over the conventional process. A thorough discussion of the two processes including tables, graphs, and schematic diagrams is presented. (Rayyan-Texas)
W71-08017

ACTIVATED SLUDGE SYSTEM VARIATIONS, SPECIFIC APPLICATIONS,
Associated Engineering Services Ltd., Vancouver (British Columbia).
J. M. Stewart.
Proceedings, Ontario Industrial Waste Conference, 15th, p 93-115, June 9-12, 1968. 16 fig, 14 ref.

Descriptors: *Kinetics, *Biological properties *Physical properties, Mathematics, Synthesis, Respiration, *Activated sludge, Wastes, Aeration, Biochemical oxygen demand, Oil, Stabilization, *Sludge treatment, Waste water treatment.
Identifiers: Suspended solids (SS).

To understand how the characteristics and desired degree of treatment can determine the system design requirements, an understanding of the system reaction kinetics is necessary. The physical and biological reactions are discussed with mathematical and stoichiometric equations which cover energy production, protoplasm synthesis and endogeneous respiration. Sludge produced by extended aeration is considerably less than that produced in short term or conventional systems. Mathematical relations describing the reaction kinetics in a soluble and a soluble plus particulate wastes receiving system are presented. After reviewing the conventional activated sludge system, specific application of the activated sludge to suit various types of wastes are presented. The step aeration has the advantage of carrying higher weights of organisms in the system than a conventional system, while still maintaining a lower SS load on the clarifier. Contact stabilization, although it permits the use of the same loading factor of the conventional system, allows up to twice the volumetric loading. It is ideally suited to treatment of waste water in which a large portion of the BOD is present in suspended or colloidal form. The water cooling tower is suitable for treating refinery or petrochemical waste water. Those three systems and five more: Hatfield-Kraus, activated aeration, short term aeration, extended aeration, and aerated lagoons are discussed with their flow diagrams. (Rayyan-Texas)
W71-08018

NEW APPROACHES TO WASTE WATER TREATMENT,
Cincinnati Water Research Lab., Ohio.
Charles L. Swanson.
Proceedings, Ontario Industrial Waste Conference, 15th, p 117-145, June 9-12, 1968. 9 fig, 4 tab, 10 ref.

Descriptors: *Waste water treatment, *Biochemical oxygen demand, Effluent, Pollutants, Biological treatment, Phosphate, Nitrogen, Screens, Sedimentation, *Filtration, Osmosis.
Identifiers: *Suspended solids (SS).

Conventional waste treatment processes are highly effective in removing BOD and SS but not to the extent to make the effluent suitable for reuse application. A table summarizing the waste water pollutants and applicable treatment processes is presented. A discussion on the stage of development of various processes and alternative treatment techniques available or being developed is included. Those processes include: (1) conventional biological treatment, (2) SS and particulate BOD removal, (3) phosphate removal, (4) nitrogen removal, (5) refractory organic removal, and (6) dissolved inorganic removal. These processes are discussed in detail including estimated costs. For example, SS and particulate BOD removal could be achieved by screening at a cost of $0.015/1000 gallons or by filtration at a cost of $0.025/1000 gallons. Removal of dissolved inorganics by electrodialysis is estimated at $0.141/1000 gallons while by ion exchange it is $0.25/1000 gallons. All these estimated costs are summarized in one table. Generally speaking the cost of complete treatment beyond conventional processes for removal of nutrients, organics, and inorganics is estimated at $0.26-0.30/1000 gallons as compared to an average of $0.11/1000 gallons for secondary treatment. However, the fact that water produced from complete treatment methods is potable, and therefore salable, should help to ease the financial burden. (Rayyan-Texas)
W71-08019

PHOSPHATE REMOVAL BY ACID HYDROLYSIS AND CHEMICAL PRECIPITATION,
Ryckman, Edgerly, Tomlinson and Associates, Inc., St. Louis, Mo.
Cecil Lue-Hing, H. D. Tomlinson, and D. W. Ryckman.
Proceedings, Ontario Industrial Waste Conference, 15th, p 203-215, June 9-12, 1968. 7 fig, 12 ref.

Descriptors: *Phosphates, Lime, Acid, Catalysts, Solvent, Colloids, Cations, Enzymes, Hydrogen ion concentration, Temperature, Oxidation, *Waste water treatment, *Organophosphorus compounds, *Chemical precipitation, *Chemical degradation.

Most of the present phosphate removal methods are limited to inorganic phosphates with 100 mg/l concentration utilizing lime within a pH range of pH 8-pH 11 or adsorption and precipitation. This method 'Acid catalyzed Hydrolytic Degradation and Chemical Precipitation' is effective for both industrial and domestic wastes rich in organic phosphates. The factors governing the rate hydrolysis of organophosphates are: (1) pH, (2) temperature, (3) type and concentration of catalysts, (4) structure of compound, (5) type of solvent, (6) collodial gels, (7) complexing cations, and (8) enzymes. The steps used in this process are: after adjusting the waste water to a predetermined pH at ambient temperature and reacting with hydrated lime an insoluble precipitate of calcium phosphate will form which is then flocculated and removed as sludge in the primary sedimentation unit. The phosphate free effluent is released to the other units for further treatment as required. The projected cost of acid processing appears more favorable especially in terms of lime requirements, since it requires less than 25% of the lime used in other processes per unit weight of PO4 removed. Alkaline removal of phosphate as well as all chemical phosphate removal processes in use produce calcium phosphate precipitate in subsequent biological oxidation systems. (Rayyan-Texas)
W71-08022

KINETIC STUDIES OF THE OXIDATIVE DEGRADATION OF DETERGENT AND RELATED SPECIES IN AQUEOUS SOLUTION. I. MICROBIOLOGICAL STUDIES,
Maryland Univ., Baltimore. Dept. of Microbiology.
Marilyn J. Ripin, Kerry F. Noon, and Thomas M. Cook.
Available from the National Technical Information Service as PB-199 365, $3.00 in paper copy, $0.95 in microfiche. University of Maryland Water Resources Research Center, Completion Report, Sept 1970. 69 p 14 fig, 13 tab, 32 ref.

Descriptors: *Detergents, *Biodegradation, *Bacteria, *Cultures, Linear alkylate sulfonates, Oxidation, Microbiology, Kinetics, Model studies, Enzymes.
Identifiers: *Pseudomonas testosteroni, Alkylarylsulfonates, Arylsulfonates, Catechol, Benzene sulfonate, p-toluene sulfonate.

A model simulating bacterial degradation of LAS detergents was devised by employing simpler compounds, benzene sulfonate and p-toluene sulfonate,

as the sole sources of carbon and sulfur. This substitution permitted observation of alkylarylsulfonate oxidation by a single species of bacteria, identified as Pseudomonas testosteroni. The recorded features of the biodegradation process included effect of substrates and buffers, growth kinetics, cells' respiratory activity, and the influence of inhibitors. Results suggested that catechol or corresponding alkyl derivatives form intermediate products, and that the reaction involves participation of at least one enzyme, catechol-2,3-dioxygenase. Oxidation of catechol via a meta cleavage enzyme has been demonstrated with whole cells, as well as cell-free extracts. Biodegradation of linear alkylate sulfonate detergents was achieved only with mixed bacterial cultures. (Wilde-Wisconsin)
W71-08029

RECLAMATION OF WASTE WATER FOR WELL INJECTION,
Los Angeles County Flood Control District, Calif.; and California Inst. of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
John K. Mitchell, and William R. Samples.
Los Angeles County Flood Control District, California, Feb 1967. 250 p, 32 fig, 57 tab, 14 ref. Partially supported by a research grant by the US Public Health Service.

Descriptors: *Water reuse, *Injection, *Tertiary treatment, *Filters, *Waste water treatment, *Recharge wells, Injection wells, California, Groundwater, Saline water intrusion, Water purification, Sewage treatment, Water supply, Reclaimed water, On-site investigations.
Identifiers: *Los Angeles, Hyperion plant.

The Los Angeles Flood Control District reports its investigation of high-rate treatment facilities to polish standard-rate activated sludge effluent to make it suitable for use as a water supply for recharge through injection wells. Previous testing by the District using slow sand filtration for Hyperion effluent indicated that a satisfactory water could be provided. Due to the unavailable large land area required by this system, the present test was undertaken to demonstrate the potential of high rate filtration. The investigation conducted at the City of Los Angeles Hyperion Treatment Plant had three basic phases. First was tertiary treatment to polish the standard rate activated sludge effluent. The facilities used for this consisted of parallel operation of a rapid sand filter, pressure sand filter, and a diatomaceous earth filter. Second, the polished water from one of the filters was stored in a reservoir and then recharged into a test site injection well. Third, observation wells were used to monitor the water quality as it moved through the underground aquifer. Either rapid sand filtration with pretreatment or diatomaceous earth filtration can be used to produce water from Hyperion secondary effluent which is acceptable for injection. The estimated cost is $24 per acre-foot. Further testing of water reclamation and injection, on a larger scale, is recommended. It is suggested that the District cooperate with other agencies to make reclaimed water available for operation of the fresh water barriers which are maintained to prevent sea water intrusion. (Poertner)
W71-08124

COST OF MUNICIPAL SEWAGE TREATMENT PLANTS IN ILLINOIS,
Illinois State Water Survey, Urbana.
Thomas A. Butts, and Ralph L. Evans.
Illinois Department of Registration and Education, Springfield, Circular 99, 1970. 37 p, 16 fig, 12 tab, 5 ref.

Descriptors: *Construction costs, *Treatment facilities, *Sewage treatment, *Cost comparisons, *Cost analysis, Municipal wastes, Waste water treatment, Least squares method, Regression analysis, Estimated costs, Illinois, Cities.
Identifiers: *Sewage treatment plant costs.

Construction costs are summarized for 291 municipal sewage treatment plants built in Illinois between 1957 and 1968. Most of the plants were built under the Federal Construction Grants Program (Public Law 660). Least squares regression analysis was used to relate design population equivalents to either unit costs in terms of dollars per design equivalent or total costs in terms of dollars. The data were categorized into eight classifications for new plants and two for plant additions. Also, regression equations were developed for estimating lagoon land costs, plant operating costs, and FWPCA construction cost indexes. Use of information presented in this circular should provide reasonable estimates of the initial investments involved in constructing and equipping sewage treatment plants in the State. Sample cost estimates are given for each type of plant analyzed. These estimates are not alternatives to detailed engineering cost analyses; rather, they are intended to permit reasonable estimates with a minimum of effort for comparative purposes. Cost figures and design criteria were supplied by consulting engineers, the Illinois Sanitary Water Board, and the Great Lakes Regional Office of the Federal Water Pollution Control Administration. Approximately 325 projects were reviewed, and the data for 291 were considered adequate for statistical analysis. (Poertner)
W71-08130

CENTRAL FRESNO COUNTY WATER AND LIQUID WASTE. VOLUME 1, SUMMARY SUPPLEMENT.
Fresno County Planning Dept., Calif.
For primary bibliographic entry see Field 06B.
W71-08178

DESIGN OF SEWER SYSTEMS,
Wisconsin Univ., Milwaukee. Coll. of Applied Science and Engineering.
For primary bibliographic entry see Field 05G.
W71-08199

DESORPTION OF AMMONIA FROM ANAEROBIC LAGOON,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
J. K. Koelliker, and J. R. Miner.
Journal Paper No J-6873 of Iowa Agricultural and Home Economics Experiment Station, Ames. Paper presented 1971 Mid-Central Meeting, American Society Agricultural Engineers, Paper No MC-71-804. 21 p, 6 fig, 2 tab, 9 ref. USDI Public Law 88-379, HEW EC 00283-02.

Descriptors: *Farm wastes, *Anaerobic digestion, Farm lagoons, Biodegradation, Ammonia, Hogs, Disposal, Temperature, Hydrogen ion concentration, Nitrogen cycle, Nitrogen compounds, Laboratory tests, *Mass transfer, *Waste water treatment.
Identifiers: *Anaerobic lagoons, *Nitrogen balance, Ammonia desorption, Nitrogen transformations, Swine.

The loss of ammonia from an anaerobic manure lagoon has been monitored by measurement of ammonia concentrations in air surrounding the lagoon and by a nitrogen balance for the same lagoon from Nov. 1969 - Oct. 1970. Theoretical considerations of desorption and data from the lagoon indicate that the nitrogen loss to the air can be predicted. An anaerobic lagoon may well be a nitrogen sink if no liquid must be removed from it. The rate of ammonia desorption from a lagoon surface is accelerated by increasing alkaline pH, higher temperatures, and increasing wind velocities. (Christenbury-Iowa State)
W71-08207

NUTRIENTS IN EFFLUENTS FROM ANIMAL PRODUCTION AREAS.
Missouri Univ., Columbia. Dept. of Agricultural Engineering; and North Carolina State Univ., Raleigh.
Jackie W. D. Robbins, George J. Kriz, and David H. Howells.
Paper presented at 1971 Mid-Central Meetin
American Scociety Agricultural Engineers, Pap
No MC-71-102. 20 p, 5 fig, 4 tab, 10 ref.

Descriptors: *Farm wastes, *Nutrient
*Coliforms, *Runoff, Management, Phosphat
Nitrogen, Biochemical oxygen demand, Bacteri
Farm lagoons, Pollutants, Disposal, Hogs, Poultr
Cattle, Waste water treatment.
Identifiers: Total coliform, Fecal coliform, Swin
Total Organic Carbon (TOC).

Twelve typical agricultural areas representing thr
types of animal waste management techniques
land spreading including pasture and drylot uni
lagooning and direct discharge into streams--we
studied to determine the amounts of and facto
governing stream enrichment from swine, dai
poultry and beef production operations. (Christe
bury-Iowa State)
W71-08208

FARM ANIMAL-WASTE MANAGEMENT.
Iowa State Univ., Ames. Dept. of Agricultural E
gineering.
For primary bibliographic entry see Field 05G.
W71-08209

COST OF DEHYDRATING POULTR MANURE.

Poultry Digest, p 143, Mar 1971.

Descriptors: *Farm wastes, *Dehydration, *Cos
Poultry, Equipment, Fertilizers, *Waste treatmen
Identifiers: Shelf life.

Conventional dehydrating equipment is availab
for drying poultry manure. However, the cost of t
processed manure is likely to exceed $20 per ton
two-stage drying process has been developed th
brings the cost down to $7.60 per ton for a produ
with 10% moisture. The final product is a fi
powder, free of offensive odors, has shelf life and
has the qualities required for sale as an organic fe
tilizer. It contains 4 to 5% nitrogen, 3% phospho
acid, and 2.5% potash. (Christenbury-Iowa State
W71-08211

HOW CAN PORK PRODUCERS COMPL WITH ENVIRONMENTAL QUALITY STA DARDS,
Iowa State Univ., Ames. Dept. of Agricultural E
gineering.
J. Ronald Miner.
American Pork Congress-Proceedings, Enviro
mental Quality Workshop, Des Moines, Iowa, M
3, 1971. p 98-102.

Descriptors: *Farm wastes, *Hogs, *Environme
*Pollution abatement, Water quality, Standar
Water pollution, Air pollution, Odor, Confinem
pens, Organic matter, Nutrients, Nitrog
Phosphorus, Eutrophication, Algae, Pathoge
bacteria, Effluent, Irrigation, Storage, Wa
disposal.
Identifiers: *Environmental quality, Air contar
nant, Stream quality, Waste management, Manu
collection, Manure transport.

To prevent water and air pollution while maintai
ing environmental quality is a complex problem
becomes more complicated by trying to des
waste management systems which contribu
materially to our effectiveness as pork produc
with pollution control as a side benefit. A sw
manure management system might include a c
lection device, a manure transport system, so
means of manure storage and/or treatment, a
finally, a manure or effluent disposal system
some cases more than one of these compone
may be included in a single component. Giving
tial consideration to the disposal scheme will h
determine decisions to be made concerning
other aspects of the system. There is much rema
ing to be learned relative to the control and m
surement of odors. Various odor levels can

ieved by the judicious selection of manure han-
g techniques. (White-Iowa State)
1-08214

HYDRATION OF ANIMAL WASTES,
icultural Research Service, Columbia, Mo.
nsportation and Facilities Research Div.
man F. Mayes.
er presented at the 1971 Mid-Central Meeting
erican Society of Agricultural Engineers, Paper
MC-71-805. 15 p, 2 fig, 4 ref.

criptors: *Farm wastes, *Fertilizers, *Dehydra-
, Disposal, Livestock, Economics, Marketing,
nomic feasibility, Operating, Storage, Operat-
costs, Operation and maintenance, Costs,
te treatment.
tifiers: Dehydrator design.

r large terminal livestock markets have been
ydrating cattle and sheep manure since the
y 1950's. The dehydrated manure is being
chandised as a specialty fertilizer. The design
ures of these dehydrators, the operating
blems and some typical operating costs are
ewed. These markets have shown that animal
tes can be dehydrated and marketed. While a
it may not have been realized from the sale of
dehydrated manure, it may have been the
apest method of disposal. (Christenbury-Iowa
e)
1-08216

MODEL STUDY TO DETERMINE THE EF-
CTS OF VENTILATION SYSTEMS UPON
3 CONCENTRATIONS IN SWINE CONFINE-
NT HOUSING,
o State Univ., Columbus. Dept. of Agricultural
ineering; and Nebraska Univ., Lincoln. Dept.
gricultural Engineering.
. Ifeadi, and J. A. DeShazer.
er presented 1971 Mid-Central Meeting Amer-
Society of Agricultural Engineers, Paper No
-71-103. 9 p, 1 fig, 1 tab, 2 ref.

criptors: *Model studies, *Odors, *Ventilation,
mmonia, Laboratory tests, Physical models,
ctural models, Hogs, Air circulation, Statistical
dels, Farm wastes, Waste water treatment.
tifiers: Slotted floors, Airflow rates, Inlet
ems, Exhaust systems.

lexiglass model 1/12 the size of an existing
ic building was used to determine the effect of
ous ventilation systems upon the NH3 concen-
on in the model. From this investigation, it was
d that as more air exhausted below the floor
concentration of NH3 above the floor
reased. Also the inlet settings influenced the
centration of NH3 above the floor. (Christen-
Iowa State)
1-08217

AEROBIC LAGOONS: CONSIDERATIONS
ESIGN AND APPLICATION,
nell Univ., Ithaca, N.Y.
mond C. Loehr.
isactions of the American Society of Agricul-
l Engineers, Vol 11, p 320-322 and 330, 1968.
. 4 tab, 14 ref.

criptors: *Farm lagoons, *Anaerobic digestion,
sign, *Solids, Anaerobic conditions, Farm
es, Temperature, Gases, Biochemical oxygen
and, Waste water treatment.
tifiers: *Solids removal, Loading, Gas produc-
effluent quality.

ign and application of anaerobic lagoons for
tment of wastes from farm animals in confine-
t is described. The purpose for anaerobic
ons is given in relation to aerobic lagoons and
r treatment systems. The article proceeds to
uss size requirements, loading restrictions and
ng, both natural and mechanical as required.
ntities and quality of gas production are discussed as well as temperature relationships to gas production and other operating conditions. A short analysis of effluent quality is presented. Solids removal is discussed in some length. The article concludes by mentioning some difficulties such as potent effluent, warm temperature requirements and odors due to biochemical imbalance. (Parker-Iowa State)
W71-08220

MANURE LAGOONS.....DESIGN CRITERIA AND MANAGEMENT,
Maryland Univ., College Park. Dept. of Agricultural Engineering.
Harry J. Eby.
ASAE Paper No 61-935. Agricultural Engineering Journal, Vol 43, p 698-701, 714-715, Dec 1962. 6 fig, 1 tab, 19 ref.

Descriptors: *Farm lagoons, *Design criteria, Water temperature, Sewage treatment, Aerobic bacteria, Aquatic plants, Anaerobic bacteria, Algae, Biochemical oxygen demand, Oxidation lagoons, Sludge, Photosynthetic oxygen, Farm wastes, Waste water treatment.
Identifiers: *Site selection, Loading.

Criteria to be considered when designing a lagoon for treatment of wastes produced by animals in confinement is discussed. It mentions situations where lagoons would not be feasible. Seven criteria for site selection are given. The physical, chemical and biological factors discussed include temperature, light, specific gravity, mixing, nutritional effects, pH effects, toxic effects, and interrelationship of biological species. Also mentioned is the algal-bacterial relationship. Design factors for size and volume are given. The article concludes with management problems encountered such as floating debris, overloading, intermittent loading, aquatic weeds and sludge build-up. (Parker-Iowa State)
W71-08221

NITRATE REMOVAL FROM AGRICULTURAL WASTE WATER,
Federal Water Pollution Control Administration, Fresno, Calif.; and California Dept. of Water Resources, Fresno.
Percy P. St. Amant, and Louis A. Beck.
In: Water Quality Management Problems in Arid Regions, Water Pollution Control Research Series, 13030 DYY, 6/69, Oct 1970, USDI, Federal Water Quality Administration, p 1-8. 1 tab, 1 fig.

Descriptors: *Return flow, *Nitrates, Water pollution, Desalination, Algae, Denitrification, California, Filters, Particle size, Anaerobic conditions, Waste water treatment.
Identifiers: *Nitrate removal, Algae stripping, Pond denitrification, Filter denitrification, Methanol, Bacterial denitrification, San Joaquin Valley.

The problem of disposing of irrigation waste water from the San Joaquin Valley of California is a very large one. The most serious potential pollutant is nitrogen in the nitrate form. A waste water treatment center at Firebaugh, California has organized and is carrying out research in the areas of desalination, algae stripping, and bacterial denitrification. Algae stripping simply involves growing a crop of algae to remove nitrogen from the water, and then harvesting the algae. Various markets have been proposed for the use of algae. Two methods of bacterial denitrification being explored are pond denitrification, and filter denitrification. The three denitrification methods are compared as to land requirements and project costs. Each is nearly the same in cost - around $10 per acre foot, however the algae stripping method requires much more land. (See also W71-06111) (White-Iowa State)
W71-08223

WATER QUALITY REQUIREMENTS AND REUSE OF WASTE WATER EFFLUENTS,
Federal Water Pollution Control Administration, Washington, D.C.
Stanley J. Dea.
In: Water Quality Management Problems in Arid Regions, Water Pollution Control Research Series, 13030 DYY, 6/69, Oct 1970, USDI, Federal Water Quality Administration, p 37-44. 1 tab.

Descriptors: *Water quality, *Waste water treatment, *Water reuse, Effluent, Waste water, Water Quality Act, Beneficial use, Water supply, Biological treatment, Sewage effluents, Filters, Activated sludge, Tertiary treatment.
Identifiers: *Nutrient removal.

From the overall view of potential water supply shortages in the United States, advanced waste treatment has the greatest promise at locations where the municipal waste water is presently discharged into the ocean or other sinks, and is lost for reuse. An advanced waste treatment facility for turning waste discharges into potable water is described for New York City. The most urgent needs in sewage treatment technology include modifications of 'conventional' processes and advanced or tertiary treatment. Advanced treatment for the removal of nutrients, organics, and inorganics can be accomplished for about 26-30 cents/1000 gallons compared to 11 cents/1000 gallons for secondary treatment. However, the reclaimed waste water from advanced treatment has economic utility and value for reuse. (See also W71-06111) (White-Iowa State)
W71-08224

DISTILLATION OF WASTE WATERS: A WATER RESOURCE FOR ARID REGIONS,
Federal Water Pollution Control Administration, Washington, D.C. Office of Research and Development.
Allen Cywin, George Rey, Stanley Dea, and Harold Bernard.
In: Water Quality Management Problems in Arid Regions, Water Pollution Control Research Series, 13030 DYY, 6/69, Oct 1970, USDI, Federal Water Quality Administration, p 85-94. 14 ref, 2 fig, 1 tab.

Descriptors: *Distillation, *Waste water treatment, Effluent, Potable water, Water reuse, Water quality, Brackish water, Sewage treatment, Costs, Waste dilution, Demineralization, Water resources.
Identifiers: *Blowdown ratio, Salt removal, Mineral content, Total dissolved solids.

The authors propose distillation of municipal waste water for the production of low mineral content water for industrial purposes, particularly for those industries which require such water in large quantities. Distillation has previously been limited in arid regions to applications using saline waters as a feedwater supply. The use of waste water may very possibly result in less costly distilled water. A part of the waste water renovation costs can be attributed to pollution control. Dilution of tertiary-treated effluents with a lower mineral content municipal water can also produce a product water of acceptable mineral content. The lower concentrations of sulfate and total dissolved solids in waste water effluents is also advantageous. Total treatment costs for the processes involved are given. (See also W71-06111) (White-Iowa State)
W71-08227

STORM SEWER SYSTEMS,
American Public Works Association, Chicago, Ill. Research Foundation.
Herbert G. Poertner.
In: Public Facility Needs, Washington, DC, 1966, p 152-174.

Descriptors: *Sewers, *Runoff, *Waste water, *Investment, *Economic analysis, *Drainage, Canals, Precipitation floods, Pollution, Capital, Costs, Benefits, Financing.
Identifiers: User charges, Ownership, Urban drainage.

A description is presented of the nature and composition of storm sewer systems, their functions, and the fundamental principles involved. The services rendered by such systems, particularly avoidance of economic loss from flooding and inadequate runoff, is cited, along with dangers and damages that can exist. Both quantitative and qualitative standards of performance and design are discussed. A brief history of storm sewers is incorporated into a discussion of existing capital plant of the sewers and capital investment in urban drainage improvements is presented by both regional and state breakdowns, indicating both sewer system age and ownerships. Costs, charges, and benefits of the sewer system present the economic basis for the systems, and trends of capital outlay are presented according to expenditures and sources of financing. Estimated capital requirements present a projection for needs and prospective capital outlays in the storm sewer systems and indicate the major sources to be tapped for such financing. (See also W71-08281) (Murphy-Rutgers)
W71-08285

SANITARY SEWER COLLECTION SYSTEMS,
Department of Housing and Urban Development, Washington, D.C.
Peter Rowan.
In: Public Facility Needs, Washington, DC, 1966, p 137-151.

Descriptors: *Economic evaluation, *Waste disposal, *Sewers, Capital financing, Costs, Economics of scale, Drainage, Streams, Rivers, Pollution, Groundwater.
Identifiers: *Economic development, User charges, Public service, Ownership patterns, Public health.

A comprehensive study is presented of sanitary sewer collection systems as the means of removing wastes. A brief history of the development of such systems is presented, which incorporates a discussion of pollution in addition to presenting various means of waste removal. The physical characteristics and the standards of performance of the sewer systems are precisely described, and the existing capital plant for such facilities is discussed. Particular attention is given to growth, distribution, and ownership patterns. Construction, operation and maintenance costs are juxtaposed with user charges, and trends in capital outlay are subdivided into annual outlays and sources of financing. Needs and prospective capital outlays for the future are presented, and estimated capital requirements are suggested, along with potential means of financing. The role of federal assistance in the future economic development of the sewer collection systems is also dealt with in some detail. (See also W71-08281) (Murphy-Rutgers)
W71-08286

ELECTRIC POWER AND THERMAL DISCHARGES; THERMAL CONSIDERATIONS IN THE PRODUCTION OF ELECTRIC POWER.
For primary bibliographic entry see Field 05B.
W71-08298

THERMAL WASTE TREATMENT AND CONTROL,
Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab.
Frank H. Rainwater.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 189-212, 1971. 3 tab.

Descriptors: *Thermal powerplants, *Cooling, *Cooling towers, Evaporation, Brackish water, Meteorology, Environmental effects, Thermal pollution, Economic feasibility, Waste water treatment.
Identifiers: *Thermal waste treatment, Colling ponds, Cooling systems, Dry cooling towers, Spray canals.

With today's technology the electric power industry can meet State-Federal water temperature standards. Four basic supplementary heat rejection units that are economically attractive at the present time, for large powerplants are described: natural draft towers, mechanical draft towers, open ponds and spray canals. Three alternative cooling systems are discussed: (1) open-cycle system, that may involve either once-through systems or open-cycle waste heat treatment systems incorporating one of the afore mentioned treatment units; (2) recycling systems with waste heat treatment facilities; and (3) combination systems for seasonal operation. It is predicted that spray-type condensers and dry towers of the Heller system will take their place with evaporative cooling systems as a practical and competitive alternative in the near future. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08307

CONSIDERATIONS IN TRANSLATING ENVIRONMENTAL CONCERN INTO POWER PLANT DESIGN AND OPERATION,
Duke Power Co., Engineering Department.
William S. Lee.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 229-248, 1971. 1 fig.

Descriptors: *Thermal pollution, *Thermal powerplants, *Cooling water, *Design criteria, *Environmental effects, Heat, Mixing, Cooling towers, Waste water treatment.
Identifiers: *Heat dissipation, Dry cooling towers, Spray ponds.

To better translate our environmental concern into power plant design and operation, we must develop techniques for reliable ecological forecasting with which we can predict in advance the relative effects of alternative cooling methods. The types of cooling systems classified according to heat dissipation mechanisms are (a1) remote and gradual dissipation by mixing, (2) rapid dissipation locally using open water bodies, (3) rapid dissipation on site with cooling towers and spray ponds, and (4) seasonal shortage of heat in water bodies for later dissipation in cool weather. A drive toward improved cycle efficiencies, including breeders, to reduce heat rejection must be pressed harder. Monstrous in size, costs and in water losses, cooling towers should be critically considered from the viewpoint of alternative, innovative designs. Dry cooling towers should be considered as an alternative. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08309

POWER PLANT COOLING IN PERSPECTIVE,
Commonwealth Associates, Inc., Jackson, Mich. Architectural and Engineering Systems.
A. C. Kelsall.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 249-268, 1971. 9 fig.

Descriptors: *Thermal pollution, *Thermal powerplants, *Cooling, *Cooling towers, *Ponds, *Pumped storage, *Peak power, Evaporation, Convection, Radiation, Heated waters, Thermodynamics, Waste water treatment.
Identifiers: Selective withdrawal, Spray ponds.

Following a general presentation of the second law of thermodynamics, the author discusses three means of heat dissipation that can be applied through the cooling facilities: evaporation, convection and radiation. Advantages of cooling ponds are discussed; the need for supplementary evaporative devices, such as spray ponds or cooling towers, is stressed. Assuming that some precooling of power plant water is required, an alternate to riverside cooling towers can be developed where there is room for an off-channel holding pond. A conventional intake structure is used to withdraw cool water from the river. The warm water discharg from the condensers is then pumped up to a h ing reservoir on a 24-hour per day basis, to released, after cooling off, during peak perio The system constitutes a minature pumped stor installation. (See also W71-08298) (Oleszkiew Vanderbilt)
W71-08310

NATURAL BODIES OF WATER FOR CO ING,
Sargent and Lundy, Chicago, Ill.
Tor D. Kolflat.
In: Electric Power and Thermal Discharges; T mal Considerations in the Production of Ele Power. Gordon and Breach, New York, p 295- 1971. 18 ref, 31 fig.

Descriptors: *Thermal pollution, *Thermal po plants, *Heated water, *Cooling, *Heat bala *Condensers, Evaporation, Convection, Radia Waste water treatment.

The electrical energy waste heat contributio 6.3 x 10 to the 12th power BTU/day, estimate the year 2000, represents about 0.07% of the nual average natural solar energy contributio 205 x 10 to the 15th power BTU/day. A discussing the hydro-thermal effects of discharge to surface water, the author desc techniques to alter natural behavior of river w In order to draw the coolest possible water fro river a skimmer wall is on occasion 'skimming' off the hot water floating on the Several plants discharge the warm water at th of the river to accelerate dissipation of its he the air. When rapid mixing is required a dif pipe is used. Dilution within the condenser i tained by the establishment of condenser de Another arrangement is to select the optimum denser rise independent of dilution considera and dilute the water after it leaves the condens 25F condenser rise may be reduced to 16F, 12 8F by adding dilution water in the amount of 100% or 200% of the condenser flow respect (See also W71-08298) (Oleszkiewicz-Vanderb W71-08313

COOLING TOWERS FOR LARGE STE ELECTRIC GENERATING UNITS,
Black and Veatch, Kansas City, Mo.
Riley D. Woodson.
In: Electric Power and Thermal Discharges; mal Considerations in the Production of El Power. Gordon and Breach, New York, p 351 1971. 6 fig, 5 tab.

Descriptors: *Thermal pollution, *Cooling to *Thermal powerplants, *Economic feasi *Capital costs, Cooling, *Condensers, Co water, Investment, Economic efficiency, Nuclear powerplants, Environmental e Waste water treatment.
Identifiers: *Dry cooling towers, *Wet c towers, Mechanical draft, Natural draft.

All feasible types of cooling towers have bee sidered and the cost of each type is illustrate typical 800 megawatt unit. Mechanical dra towers are the most economical type of c towers for nearly all applications. Althoug parently feasible, dry type cooling towers a economically competitive due to high inve costs and lower steam cycle efficiency due t condenser pressures. Some may be installed special circumstances. Sophisticated desig optimization of both cooling tower and c systems are being done and will contin develop, including direct digital control m ment of cooling tower operation. (See also 08298) (Oleszkiewicz-Vanderbilt)
W71-08314

. Ultimate Disposal of Wastes

DER CONE SEWAGE DISPOSAL AT RTH LAKE TAHOE, CALIFORNIA,
fornia Div. of Mines and Geology, Sacramento.
ert A. Matthews, and Alvin L. Franks.
er and Sewage Works, Vol 118, No 1, p 2-5, 1971.

criptors: *Sewage disposal, *Effluent, *Percation, Seismic studies, Fractures (Geology), nage, Infiltration, Monitoring, Flow rate, neability, California, Waste disposal.
tifiers: Lake Tahoe (Calif), Truckee River if).

a result of extensive field investigations and uations 'Cinder cone' was selected as sewage osal area to handle 20 mgd of sewage. Seismic actions gave indications of rock formations and the effluent will flow towards the Truckee r drainage to the west. Four drill holes were e and carefully studied by bore hole television eras. Results of the drilling and water testing of e holes indicated that the subsurface would ac- the effluent 1500 ft of trenches were made in area and graphed into 4 groups. Percolation of group 1 was 620 gpm after 30 hours and eased to 300 gpm after 200 hours. Group 2 a ar material to group 1 has a percolation rate of gpm after 200 hours. This decreased rate is due norter trench length rather than variation of erial. Tests indicate that percolation rate in p 3 and 4 may be too rapid to provide filtration treatment. Data from spring No. 8 showed an ease in chloride with increase in coliform nt. No change of the quality of water of the r sampling areas was detected. (Rayaan-Tex-

-07771

HNIQUES OF DEEP WELL DISPOSAL-A E AND EFFICIENT METHOD OF POLLUN CONTROL,
rican Industrial Disposal System Inc., Pittgh, Pa.
primary bibliographic entry see Field 05G.
-08015

INERATION OF PROCESS INDUSTRY STES,
an Ltd., Cooksville (Ontario).
primary bibliographic entry see Field 05G.
-08016

ECONOMICS OF ALTERNATIVE THODS OF WHEY DISPOSAL AT THERN ONTARIO CHEESE FACTORIES,
rio Dept. of Agriculture and Food, Toronto.
primary bibliographic entry see Field 05G.
-08021

POSAL OF RADIOACTIVE WASTE FROM DSCALE,
stry of Agriculture, Fisheries and Food, estaft (England). Fisheries Radiobiological

primary bibliographic entry see Field 05G.
-08161

Water Treatment and Quality Alteration

LATION OF POLIOVIRUS FROM DRINKWATER,
igan State Univ., East Lansing. Dept. of obiology.
er N. Mack, and Donald B. Coohon.
igan Agricultural Experiment Station Journal le No 5276, nd (1970). 7 p, 1 tab, 3 ref. RR Project A-026-MICH (1).

Descriptors: *Water treatment, *Public health, *Viruses, Diseases, Water pollution control, Centrifugation, Isolation, Separation techniques, Chlorination, Disinfection, Coliforms, Bacteria, Waste water treatment.
Identifiers: *Poliovirus, Hepatitis, Gastroenteritis.

Evidence has accumulated to suggest that viruses can be transmitted in drinking water, but no concrete isolations had been made. Multiple cases of illness in the patrons of a southeastern Michigan restaurant, having a private well, initiated a complete epidemiological investigation of the well water. Coliform organisms were found in 2 of 5 samples of the water over a 12 month period, indicating the presence of some fecal contamination. Neither Shigella nor Salmonella organisms were isolated from the water, so further isolation techniques were used specifically to detect whether or not there were viruses present in the water. 5 gallons of well water were obtained from the well, with approximately half being treated with 60 ppm of polyethylene flocculant. Subsequent concentration and centrifugation techniques were successful and an agent was recovered which produced cytopathic effect on Green African monkey kidney cultures. A second initial recovery was also successful, and the agent was subsequently identified by standard laboratory procedures as type II poliovirus. This is believed to be the first isolation of an enterovirus from drinking water in the United States. (Lowry-Texas)
W71-07765

QUALITY VERSUS RESIDUAL CHLORINE,
Public Health Service, Cincinnati, Ohio. Control Technology Branch.
W. Ralph Buelow.
Journal American Water Works Association, Vol 63, No 1, Jan 1971. 10 fig, 3 tab, 9 ref.

Descriptors: *Chlorine, *Coliform, *Water distribution systems, Turbidity, Clarification, Groundwaters, Surface waters, Springs, *Water treatment.

This paper deals with how much, what level of, and the proper surveillance of chlorine residual. A review of some literature which shows the influence of chlorine residual on bacteriological quality in distribution systems as well as the sampling practice in Europe is presented. Chlorine residual in 1966-1967 in Cincinnati, Ohio was maintained at .85 plus or minus .2 mg/l. But in 1969-1970 this was increased to 2 mg/l with 80% as free chlorine. Tabulated results for this period show no appreciable variation in the bacteriological quality of the water and it shows that a change from combined to free chlorine residual and increase in residual concentration reduced the monthly average coliform counts. Study of the bacteriological quality of the distributed water by the use of various systems as related to chlorine practice is presented with supporting figures and tables. It is concluded from that study that surface, spring and raw well water sources need to be chlorinated if coliform was detected in the distribution system and not detected in the raw water. A presentation of this sample procedure and findings for the Cincinnati water system with illustrative drawings and tables is included. The data collected from that system support the suggestion that the bacteriological samples should be collected from known problem areas in reservoirs, dead ends and the periphery of the system. (Rayaan-Texas)
W71-07768

EFFECT OF SEASONAL EFFLUENT CHLORINATION ON COLIFORMS IN JAMAICA BAY,
R. T. Dewling, I. Seidenberg, and J. Kingery.
J Water Pollution Control Fed, Vol 42, No 7, p 1361, Jul 1970.

Descriptors: Investigations, *Chlorination, Effluents, Water pollution sources, Water quality, Data collections, Coliforms, Analytical techniques, *Overflow, *Discharge measurement, Public Health, Water treatment.
Identifiers: *Jamaica Bay (NY), *Storm overflows, Combined sewers.

This article is a report on a study conducted to demonstrate that chlorination of waste water treatment plant effluents would significantly improve the bacteriological quality of Jamaica Bay. A description of the investigation procedure, the Bay area, and its water uses and pollutants is given; water quality data collection analysis is detailed. The average daily discharge from storm and combined sewer overflows was calculated at about 34 million gallons based on a storm occurring at a frequency of about once every three days.
W71-07873

THE BACTERICIDAL EFFECT OF LIME FLOCCULATION/FLOTATION AS A PRIMARY UNIT PROCESS IN A MULTIPLE SYSTEM FOR THE ADVANCED PURIFICATION OF SEWAGE WORKS EFFLUENT,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 05D.
W71-07992

THE VIROLOGY OF WASTE WATER TREATMENT,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 05D.
W71-07993

A PRELIMINARY 'LEAST COST' STUDY OF FUTURE GROUNDWATER DEVELOPMENT IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana, Ill.
For primary bibliographic entry see Field 04B.
W71-08123

COST OF DOMESTIC WELLS AND WATER TREATMENT IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 04B.
W71-08129

CENTRAL FRESNO COUNTY WATER AND LIQUID WASTE. VOLUME 1, SUMMARY SUPPLEMENT.
Fresno County Planning Dept., Calif.
For primary bibliographic entry see Field 06B.
W71-08178

5G. Water Quality Control

WATER POLLUTION,
For primary bibliographic entry see Field 06E.
W71-07709

WATER CLASSIFICATION STANDARDS SYSTEM FOR THE STATE OF SOUTH CAROLINA.
South Carolina Pollution Control Authority, Columbia.
For primary bibliographic entry see Field 06E.
W71-07710

ENVIRONMENT,
For primary bibliographic entry see Field 06E.
W71-07715

CLEAN AIR AND CLEAN WATER SCHOLARSHIP INTERN PROGRAMS--QUALIFIED DEGREES.
For primary bibliographic entry see Field 06E.
W71-07716

MARINE POLLUTION PROBLEMS AND REMEDIES,
For primary bibliographic entry see Field 06E.

W71-07717

NATIONAL WATER QUALITY STANDARDS ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 06E.
W71-07718

SANTA BARBARA CHANNEL MORATORIUM AND ECOLOGICAL PRESERVE ACT (A BILL TO PROVIDE FOR A FEDERAL ECOLOGICAL PRESERVE IN A PORTION OF THE OUTER CONTINENTAL SHELF).
For primary bibliographic entry see Field 06E.
W71-07719

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROTECT THE NAVIGABLE WATERS OF THE UNITED STATES FROM FURTHER POLLUTION BY REQUIRING THAT PESTICIDES COMPLY WITH CERTAIN STANDARDS OF BIODEGRADABILITY AND TOXICITY.
For primary bibliographic entry see Field 06E.
W71-07721

CONSUMER ASSESSMENT OF WATER QUALITY AND THE COST OF IMPROVEMENTS,
California Univ., Berkeley. School of Public Health.
W. H. Bruvold, and P. C. Ward.
Journal American Water Works Association, Vol 63, p 3-5, Jan 1971. 3 tab, 4 ref.

Descriptors: *Water quality, *Costs, Utilities, Water rates, Surveys, Evaluation, Domestic water.
Identifiers: *Consumer assessment, *Interview schedule, Improvements, Complaints.

This paper illustrates how a consumer survey could be used to document the nature and extent of water quality problems and how information could be obtained from consumers regarding their willingness to pay for improvements in quality. Further, the use of such surveys to deal with four general issues involved in improving water quality was discussed. The interview schedule was presented. The final instrument was divided into two main parts: one dealing with consumer assessment of water quality and the other with the cost of the local water, the possible need for improving water quality, and the cost of such improvements. Tabulated data included structure ratings for water in general and taste, reasonable and highest increase, and water rates. (Wang-Rutgers)
W71-07738

BOARD OF PURIFICATION OF WATERS V TOWN OF EAST PROVIDENCE (STATE POWER TO REQUIRE CITY TO ABATE POLLUTION OF RIVER).
For primary bibliographic entry see Field 06E.
W71-07741

CITY OF NORWOOD V SHEEN (DAMAGES FOR SEWAGE FLOW ON PRIVATE PROPERTY).
For primary bibliographic entry see Field 06E.
W71-07742

SEWER AND ENVIRONMENTAL ASPECTS OF WATER QUALITY STANDARDS,
Munchito Kuribayashi.
Kogai to Taisaku, Vol 6, No 8, p 631-634, Aug 15, 1970.

Descriptors: *Sewers, *Design, *Treatment facilities, *Waste water treatment, Water quality, *Standards, Drainage, Sewerage.
Identifiers: Japan.

Improvements of existing drainage systems and extensive development of drainage works are required on the present sewer systems in order to comply with new water quality standards. Large-scale sewerage works, planned on a basin area unit system, have more advantages because of the mixture of treated wastes produced. Advanced system engineering dealing with dynamic programming and multi-level-techniques will be employed in this sewer scheme which eventually may decide general water quality.
W71-07848

THE DESIGNATION OF THE AREA AND THE WATER QUALITY STANDARD OF THE RIVER KANO,
Yoji Ogawa.
Kogai to Taosaku, Vol 6, No 7, p 541-549, Jul 15, 1970.

Descriptors: *Water pollution sources, *Water quality control, *Standards, *Water pollution control, Urbanization.
Identifiers: *Japan, *Kano River Basin.

The Kano River Basin supports fresh water fish and the water is used for irrigation purposes. Industrial development and urban growth in the vicinity of the river basin have contributed to the water pollution problem. The Economic Planning Agency which investigated the quality of the basin water in the years 1966 and 1967 designated the water area and the water quality standard so as to maintain water quality control. By the year 1975, the pollution degree is estimated to decrease approximately 60% with water pollution control based on the new standard.
W71-07851

TECHNOLOGY: TEST COMBINED SEWER TREATMENT.

Modern Power Eng, Vol 64, No 8, p 33, Aug 1970.

Descriptors: *Sewers, *Sewage treatment, *Treatment facilities, Overflow, Water pollution control.
Identifiers: *Combined sewers, *Storm sewers, *Storm overflows, Racine (Wis).

Racine, Wisconsin is the test area for a system of satellite sewage treatment plants designed to eliminate the need for separating storm and sanitary sewers. The process involves five satellite plants which will treat the discharge from the combined sewer overflow during periods of heavy runoff. A screen/dissolved air flotation unit will remove inorganic pollutants and suspended solids from the combined sewer overflow.
W71-07852

CLEVELAND FACES POLLUTION SUIT.

Chemical Week, Vol 107, No 9, p 18, Aug 26, 1970.

Descriptors: *Legal aspects, *Water pollution sources, Water pollution control, Lake Erie, Treatment facilities, City planning, Contracts, Ohio, Sewers, *Chlorination.
Identifiers: *Cleveland (Ohio), *Interceptor sewers.

The Ohio Water Pollution Control Board has directed Attorney General Paul Brown to file suit against Cleveland for failure in meeting a June 15, 1970 deadline to install temporary chlorination facilities in its sewage treatment plants which pollute Lake Erie. The city also failed to meet a July 1st deadline to contract for sanitary interceptor sewer plans in various parts of the city.
W71-07853

GRID FOR RETAINING LARGE COMPONENTS OF SEWAGE IN SEWAGE PUMPING EQUIPMENT.

Netherlands Patents ..NL 6817241.

Descriptors: *Patents, *Sewage.
Identifiers: *Pumping equipment, *Retaining gri

The grid is designed for insertion in a pipeline a for cleaning by backwashing. It is fabricated fro series of initially parallel plates bonded to the pi wall at the edges. The dimensions are such t their axial length is at least 8 times the interpl spacing.
W71-07855

CATCHBASINS CLEANED FOR $3.00.

Public Works, Vol 101, No 8, p 81, Aug 1970 fig.

Descriptors: *Cleaning, Maintenance, Cost co parisons, New Jersey, Water pollution contr *Costs.
Identifiers: *Suction machine, *Teaneck (NJ).

Teaneck, New Jersey's switch from bucket cle ing of catchbasins to suction cleaning with a Go Roads Scavenger has reduced costs of the twice year job by 80%. The rate of catchbasin clean has also increased considerably. The suct machine is also used to clean out manholes, clean streets, and to pickup and dispose of lea on streets and park grounds during autumn.
W71-07856

'BEEHIVES' PROTECT SNOW-REMOV SALT AND PREVENT WATER POLLUTION,
John R. Fitzpatrick.
Am City, Vol 85, No 9, p 81-83, Sept 1970.

Descriptors: *Control structures, *Structur *Construction, *Structural design, Water pollut sources.
Identifiers: *Canada.

Salt-sand piles, used as storage for a road clear mixture during winter months in Ontario and s ject to leaching by rain, will be covered so as to sen this potential source of contamination. This ticle discusses the construction materials, design dimensions, and the methods of erection the 20 sided, cone-shaped storage structure.
W71-07859

RENEWAL IS VALID TERM IN BOSTON.

Public Works, Vol 101, No 7, p 70-71, Jul 1970.

Descriptors: *Separation techniques, *Sewera *Storm drains, Construction materials, Url renewal.
Identifiers: *Boston (MASS), *Sanitary sewers.

As part of the Bay Village urban renewal projec Boston, the old sanitary and storm drain system replaced with separate systems. Asbestos-cem pipes were used for the first time in Boston for sanitary sewer. Reinforced concrete was used the new storm drain, which parallels the sanit sewer. Other public improvements in this area clude resurfacing of streets, renewal of derground facilities, and installation of brick si walks and gas lamps.
W71-07860

SEWERAGE PRACTICES IN THE GU COAST AREA,
John K. Mayer, Frank W. MacDonald, and Step E. Steimle.
Public Works, Vol 101, No 8, p 71-72, Aug 197

Descriptors: *Sewers, *Surveys, *City planni Construction materials, Pipelines, Infiltrati Water table, Average flow.
Identifiers: *Sanitary sewers, *Gulf Coast, Tr ment methods.

he purpose of obtaining background informa-
on sanitary sewers in the Gulf Coast areas, 71
cipalities and sewer districts spanning the
from Texas through Florida were canvassed
estionnaire during the latter part of 1967 and
rly part of 1968. The article describes the fol-
g results obtained from the survey: (1) type of
s, (2) length of sewers, (3) pipe construction
ials, (4) type of bedding used, (5) infiltration
ience, (6) soil description and depth of water
and (7) average flow and treatment used.
07861

RM SEWER ASSESSMENTS,
rd R. Dague.
c Works, Vol 101, No 8, p 62-66, 118, Aug
2 fig, 2 ref.

iptors: *Cost-benefit analysis, *Assessments,
ff coefficient, Rainfall intensity, Drainage dis-
Costs.
ifiers: *Des Moines (Iowa), *Storm sewers.

uthor presents a method of storm sewer as-
ent which was applied to a project in Des
es, Iowa. Four benefit factors considered in
tioning property costs can be utilized in storm
assessment if the relative weight of each fac-
determined by the relative benefit to be ac-
. Other factors to be considered reflecting
and therefore benefit are: (1) the area
ed, (2) the runoff coefficient, (3) the rainfall
sity, (4) the distance to the outlet, (5) the unit
cost, and (6) the slope of the sewer. Each of
factors are discussed in relation to a sub-area.
the dollar benefit to each sub-area is deter-
l, the benefit to individual properties within
reas must be ascertained. Also, in arriving at
sewer assessment, the benefit accruing to
c property must be considered. Means for
ating all of these factors are thoroughly
ibed. The Des Moines procedure outlined in
rticle does not necessarily have application to
orm sewer special assessment problems. The
f the method will come through its application
variety of storm sewer assessment problems
with success in the courts.
07863

RM SEWER DESIGN,
Rickman.
r presented at the National Conference Com-
e on Electronics, American Association of
Highway Officials, Austin, Texas, May 7-8,
23 p.

iptors: Computers, *Computer programs,
n, *Design criteria, Sewers, Water pollution
ol.
ifiers: *Storm sewers, *Storm sewer design.

Fortran program was developed to design
sewers from the basic data of rainfall,
age areas, and pipe slopes and lengths. Storm
design lends itself to a computer operation
se of the repetitive calculations involved in
ning a complicated system of interconnected
. A program has been written in Fortran II for
BM 1620 computer; a program for output list-
as written for the IBM 1401 computer to give
er presentation to the designer and engineer.
storm sewer program is now being converted
Fortran II to Fortran IV.
07864

**IONAL 'RATIONAL' METHOD OF STORM
INAGE DESIGN (DISCUSSION),**
rd A. Rogers.
gation Drainage Div, Am Soc Civil Engrs, Vol
o IR3, p 342-343, Sept 1970.

iptors: *Storm drains, *Flow rates, Computer
ams, Methodology, Drainage systems, Design.

writer, discussing his original paper with the
title, has thus far been unable to comprehend,
e extreme case of a submerged storm system
and assumed incompressible water, how the rate of flow out of the system at the outfall can differ from the rate of inflow at the inlets at any time. A lag time has been introduced into the computer program to allow for utilization of storage available within the system. The writer agrees with the thought that the design flows at individual points may be found from intensities occurring when peak flows reach the points, but he disagrees with the thought that the design for flows between the points can be made for the same hydraulic grade at different times.
W71-07865

$37 BILLION: NEW PRICE TAG FOR CITIES' WATER POLLUTION CONTROL COSTS.
Nation's Cities, Vol 8, No 8, p 8-9, Aug 1970.

Descriptors: *Estimated costs, Cost allocation, Cost analysis, *Cost comparisons, Cost sharing, *Costs, Cost trends, *Cities, City planning, *Sewers, Water resources development, Legislation, Treatment facilities, Storm runoff, Overflow, Separation techniques, *Storm sewers, Water pollution control.

The National League of Cities (NLC) and the United States Conference of Mayors (USCM) estimated between $33 billion and $37 billion will be needed to combat water pollution between 1970 and 1976, as reported by Senator Muskie, in comparison with FWQA reports of $10 billion over the five year span, 1970-1974. The NLC-USCM survey asked for specific cost data categorized in the following manner: (1) needs for primary and secondary treatment facilities; (2) needs for tertiary treatment facilities; and (3) needs for interceptor and storm sewers, including projected costs of separating storm and sanitary sewers, and/or storing storm water overflows. The survey covered 1,008 communities with a combined population of approximately 89.4 million. Based on the projection from this survey, the NLC and USCM estimated the total national needs for state and local water pollution control facilities for the next six years which includes a five percent inflation factor. Discussion on past, present, and future legislative action is included, and a cost chart based on survey results is given.
W71-07867

STORM DRAINAGE FACILITIES, UNION COUNTY, NEW JERSEY.
Union County Planning Board, N.J.

May 1970. 97 p.

Descriptors: *Floods, New Jersey, *Drainage, Storms, Design, Storage, Flow, *Storm drains, Water pollution control.
Identifiers: *Union County (NJ), *Storm sewers.

The report presents an inventory and analysis of the storm drainage facilities of Union County, New Jersey. Points of analysis were generally selected where streams cross major County throughfares. The tributary area to each of these points was determined. Estimates of minimum design flows were prepared. These suggested minimum design flows were then used to determine the adequacy of the existing drainage facility at the point of analysis.
W71-07868

STORM DRAINAGE: INVENTORY AND ANALYSIS OF MAJOR EXISTING AND PLANNED FACILITIES: VOLUME V.
Valley Regional Planning Agency, Ansonia, Conn.

Feb 1970. 38 p.

Descriptors: *Planning, *Connecticut, *Sewers, *Drainage, Floods, Sewage, *Storm drains, Water pollution control.
Identifiers: *Urban planning, Urban drainage.

The fifth of a five-volume report that is being utilized as part of the basis for an areawide water/sewer plan and program for the Valley Region is detailed herein. This volume includes an inventory and evaluation of the major existing and planned facilities. The inventory includes a delineation of present areas served by storm sewers and areas requiring flood protection. (See also W71-07869)
W71-07870

POLLUTION STINK FOULS CITY HALL,
K. W. Bennett.
Iron Age, Vol 206, No 7, p 73-75, Aug 13, 1970.

Descriptors: *Legislation, Water pollution control, Water quality control, Industries, *Cities, *Pollution abatement, Legal aspects.
Identifiers: *Law enforcement.

Although legislation has been passed concerning water pollution control in relation to industries and municipalities, enforcement of these laws has been directed more towards industrial control. However, the number of states taking action against cities which are pollution violators is on the rise. The author views the economic plight which the city faces and gives some examples of pollution abatement programs and treatment facilities under construction in cities across the United States.
W71-07872

THE INTERACTIONS OF Cu.... AND CN- WITH PARAQUAT PHYTOTOXICITY TO A CHLORELLA,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 05C.
W71-07881

AERATOR PERFORMANCE IN NATURAL STREAMS,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
Shaw L. Yu.
Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 96, No SA5, p 1099-1114, Oct 1970. 8 fig, 2 tab, 12 ref, 2 append. OWRR Project B-022-NJ (5).

Descriptors: *Aeration, *Mechanical equipment, *Water treatment, Streams, Evaluation, Dissolved oxygen, Rivers, Oxygenation.
Identifiers: Aerator efficiency, Surface aerators, Diffuser aerators.

The oxygen transfer efficiency of a commercially available surface mechanical aerator and diffuser aerator was tested on Passaic River (New Jersey). Both types of aerators were found to be substantially less efficient in the natural stream than in tanks or lagoons. Average transfer rates of the mechanical and the diffuser aerators were 2.1 and 1.2 lb of oxygen per hp-hr, respectively. The efficiency of both aerators increased with a higher rate of river discharge. The estimates of the DO at the aerator corresponded to the average of upstream and downstream DO readings. In designing a river aeration system it is essential to know the aerator's performance in the given stream. Examples illustrate conversions of specific standard transfer rates, commercially specified, to actual conditions. (Wilde-Wisconsin)
W71-07885

ADSORPTION OF ORGANIC COMPOUNDS ONTO SOLIDS FROM AQUEOUS SOLUTIONS,
Virginia Polytechnic Inst., Blacksburg. Dept. of Chemistry.
For primary bibliographic entry see Field 05D.
W71-07910

INSTITUTIONAL DESIGN FOR WATER QUALITY MANAGEMENT: A CASE STUDY OF THE WISCONSIN RIVER, VOL I, SECTION A - SUMMARY,
Wisconsin Univ., Madison. Water Resources Center.
Elizabeth L. David, Peter N. Davis, Irving K. Fox, Anthony H. J. Dorsey, and Charles H. Faulkner.
Available from the National Technical Information Service as PB-199 268, $3.00 in paper copy, $0.95 in microfiche. Technical Report, 1971. 165 p, 12 fig, 7 tab, 24 ref. OWRR Project C-1228-Wis (8).

Descriptors: *Watershed management, *Water quality, *Wisconsin, *Evaluation, *Optimum development plans, *Cost-benefit analysis, Administration, Appraisals, Administrative agencies, Coordination, Feasibility studies, Financial feasibility, Institutions, Methodology, Regional analysis, Analysis.
Identifiers: *Wisconsin River Basin (Wis).

A case study was made to determine least-cost systems for achieving specific water quality levels of the Wisconsin River Basin (Wisconsin). To initiate least-cost systems, institutional prerequisites were analyzed and alternative institutional structures considered. By application of a predictive water quality model based on dissolved oxygen and analysis of costs influencing DO levels, costs of systems to meet specified objectives are determined indicating that substantial economies can be realized by utilization of a regional management system. Alternative policies and organizational arrangements are assessed. Potential and equitable economics could be realized with substantial changes in policy framework; an effluent-charge system would prove unnecessarily costly and its administration difficult; effective results can be achieved by a combination of regulation and cost sharing of system management by waste producers. Criteria of organizational design are established and applied to three alternative organizational arrangements. An organizational system including a quasi-judicial body (to establish standards), a state water resources agency (to monitor environmental interests), and a regional implementing and operating agency would most effectively meet the desired criteria. (See also W71-05037 thru W71-05040 and W71-05383) (Auen-Wisconsin)
W71-07972

COMBINED SEWER OVERFLOW SEMINAR PAPERS.
Federal Water Pollution Control Administration, Washington, D.C. Div. of Applied Science and Technology.

Available from the National Technical Information Service as PB-199 361, $3.00 in paper copy, $0.95 in microfiche. Papers presented at Seminar at Hudson-Delaware Basins Office, Edison, NJ, Nov 4-5, 1969, Water Pollution Control Research Series DAST-37, Mar 1970. 199 p. EPA Program 11020--03/70.

Descriptors: *Waste water treatment, *Storms, Run-off, Disinfection, Coliforms, Flotation, Flocculation, Coagulation, Screens, Hydrographs, Head loss, Pressure, Economic feasibility, Technical feasibility, Cost analysis, Maintenance, Labor.
Identifiers: *Combined sewers, Segregated sewers.

A large number of cities still have combined sanitary and storm water sewers. During storms, the overflow from these sewers passes directly to the receiving waters, since the volume is too great for the treatment plant to handle. The ever-present emphasis on pollution has focused much attention on not only combined sewers, but on untreated storm water from segregated sewers as well. In falling through the atmosphere, and in washing down buildings and streets which are covered with organic pollution, the storm waters become nearly as polluted as sanitary flows, and often times more so. All of the papers presented at the conference are concerned specifically with the abatement of pollution stemming from the use of combined sewers. However, rather than reporting on methods of changing the sewer systems, most research being done calls for treating both flows anyway. Methods discussed range from microstraining to air flotation to tunnels for storage before subsequent sea disposal. Combined sewer wastes can be treated at costs reported here ranging from 4 cents to 29 cents per 1000 gallons. From these reports and investigations it becomes apparent that the technology to clean up stormwater pollution is available, the only thing lacking is its implementation. (See also W71-07979 thru W71-07989) (Lowry-Texas)
W71-07978

OVERVIEW OF CONTROL METHODS,
Environmental Protection Agency, Washington, D.C.
Francis J. Condon.
In: Combined Sewer Overflow Seminar Papers, p 9-17, Mar 1970. EPA Program 11020---03/70.

Descriptors: *Water pollution sources, *Sewers, *Infiltration, *Control systems, Treatment facilities, Control structures, Waste water treatment, Water pollution control.

Pollution problems caused by combined sewers and separate sewers that act as combined ones because of widespread infiltration and malfunctioning regulators are examined. Methods of control which are presently being investigated are discussed herein. (See also W71-07978)
W71-07979

STORAGE AND TREATMENT OF COMBINED SEWAGE AS AN ALTERNATE TO SEPARATION,
Banister Engineering Co., St. Paul, Minn.
A. W. Banister.
In: Combined Sewer Overflow Seminar Papers, p 19-36, Mar 1970. EPA Program 11020---03/70.

Descriptors: *Runoff, *Storms, Municipal wastes, Hydrographs, Floods, Sewers, Pumps, Storage, Ponds, Sampling, Odors, Maintenance, Waste water treatment.
Identifiers: Segregated sewers, Combined sewers.

A storm water storage pond has been constructed by the city of Chippewa Falls, Wisconsin. Combined sewers serve nearly all of the downtown section, and the city was ordered to separate the sewers to reduce the pollutional load on the Chippewa River. Availability of federal and state aid for development of alternatives to segregated sewers resulted in the design and construction of a holding pond system. A suitable area was located, and a pond of 10.7 acre feet was designed on the basis of data on a ten year storm. The pond was lined with a bituminous mat to facilitate cleaning and allow vehicular traffic within the pond for maintenance and grit removal. Concurrent with pond construction, additional pumping capacity was added to the pumping station, and secondary treatment facilities were added to the treatment plant. A sampling program was also instituted at this time. So far, there have been no flooded basements, no odor problems, and only two pond discharges, one of 67 mg/l BOD5 and the other of 27 mg/l BOD5. No cost estimate is presented for either the total project or the operating costs. However, problems have so far been few and maintenance has been minimal. (See also W71-07978) (Lowry-Texas)
W71-07980

POLYMERS FOR SEWER FLOW CONTROL,
Environmental Protection Agency, Washington, D.C., Storm and Combined Sewer Control Branch.
George A. Kirkpatrick.
In: Combined Sewer Overflow Seminar Papers, p 37-51, Mar 1970. 11 fig. EPA Program 11020—03/70.

Descriptors: *Pipes, *Roughness (Hydraulic), Resistance, Viscosity, Friction, Headloss, Hydraulic gradient, Turbulence, Laminar flow, Flow rates, Pressure, Temperature, Slurries, Biochemical
ygen demand, Activated sludge, Toxicity, Dew
ing, Pumps.
Identifiers: *Polymers, *Surcharging, Damping

The reduction of pipe friction, with its corresp
ing increase in flow was the subject of a 29 m
research and demonstration project. 6 poly
were tested as to their ability to decrease pipe
tion. Of these, Polyox Coagulant-701 and W
301, both supplied by Union Carbide Co. and
30, supplied by Dow Chemical Co., were the
effective. Concentrations of 150-200 ppm
polymer caused flow increases of as much a
times the original flow. From laboratory testing
project moved on to a 1563 ft. length 30 in
diameter sewer line in Dallas. 6 Piezometers
positioned, and provisions were also made for
perature measurement and sewage sample co
tion. Four runs were made to test Polyox WSR
and Polyox Coagulant-701 with polymer con
trations varying from 35-100 mg/l. These and
laboratory studies have yielded the follo
results: (1) polymers are non-toxic to bac
found in sewage during these tests; (2) poly
have neither toxic nor nutrient effects on algae
polymers are not toxic to fish; (4) a 500 mg/l
centration of polymer has a BOD5 of 1.56
and (5) polymers aid in the dewatering of slu
Addition of polymers to sewer lines in Gar
Texas to relieve surcharging of the lines is
mated to cost $6400/year. Construction and op
tion of a relief sewer would cost $27,000/
Because of the promise shown in the i
research, much polymer research is contin
(See also W71-07978) (Lowry-Texas)
W71-07981

OVERVIEW OF TREATMENT METHODS,
Environmental Protection Agency, Washin
D.C.
For primary bibliographic entry see Field 05D.
W71-07982

MICROSTRAINING WITH OZONATION CHLORINATION OF COMBINED SE OVERFLOWS,
Crane Co., King of Prussia, Pa. Cochrane Div.
W. A. Keilbaugh, G. E. Glover, and P. M. Yats
In: Combined Sewer Overflow Seminar Pape
59-99, Mar 1970. 11 fig, 5 tab, 10 ref. EPA
tract No 14-12-136.

Descriptors: *Storms, *Runoff, *Separ
techniques, Screens, Filtration, Pumps, Head
Pressure, Chlorination, Coliforms, Cost ana
Water pollution control, Waste water treatmen
Identifiers: *Combined sewers, *Microstrai
Suspended solids, Ozonation.

Microstraining has been investigated as a po
treatment method for stormwater overflows
combined sewer systems. Suspended
removals ranged from 78% to 98% using
micron screen under relatively high throug
conditions. Lower throughput volumes result
a solids removal range of 62% to 96%, with
the average. Volatile suspended solids rem
were directly correlated with suspended
BOD, on the other hand, actually increased i
17 measurements. Three possible explanatio
these phenomena are: (1) natural predators
bacteria are removed by the screen; (2) large
terial colonies are subdivided into larger nu
by straining; (3) the screening process make
bacterial food supply more available. The la
planation seemed most likely. Also, increase
idation at the point of entry will cause downst
effects to be less persistent. Further resear
needed to determine the effects of using
higher differential head. At this time, no o
tional problems have developed. A cost an
shows barscreening, microstraining and chlo
tion to cost from $10,500 to $12,800 per ac
area served. The cost of construction of sepa
sewers alone was estimated to be between $2
to $23,000 per acre. Since storm water, becau

ended and dissolved solids picked up from
t, houses, and the atmosphere, has come to be
rded as a pollutant in itself, the segregated
rs have little or no value. Therefore, develop-
t and refinement of the microstraining
niques should lead to wide spread applications
oth combined and separated sewer systems.
also W71-07978) (Lowry-Texas)
-07983

**RVIEW OF COMBINED CONTROL AND
ATMENT METHODS,**
ronmental Protection Agency, Washington,
Storm and Combined Sewer Pollution Control
ch.
am A. Rosenkranz.
Combined Sewer Overflow Seminar Papers, p
121, Mar 1970. EPA Program 11020---03/70.

riptors: *Control systems, *Storage, Water
tion control, Waste water treatment.
tifiers: *Treatment methods, *Combined
rs.

author contends that there is no single method
ither control or treatment applicable as a
plete answer to combined sewer problems. He
er holds that engineering studies must con-
all potential alternatives when seeking to
rmine a treatment method, and that physical
rol by storage must be considered in conjunc-
with potentially applicable treatment methods
rder to achieve an optimal system. (See also
-07978)
-07985

**ESSMENT OF ALTERNATIVE METHODS
CONTROL/TREATMENT OF COMBINED
ER OVERFLOWS FOR WASHINGTON,**
,
ton (Roy F.), Roslyn, N.Y.
A. DeFilippi.
Combined Sewer Overflow Seminar Papers, p
138, Mar 1970. EPA Contract No 14-12-403.

riptors: *Water pollution control, *Storm run-
Sampling, Hydrographs, Flow rates, Flood
casting, Storage, Bacteria, Cost analysis, Filtra-
Biochemical oxygen demand, Chemical ox-
demand, Flocculation, Biological treatment.
tifiers: Combined sewers, Physical treatment,
ended solids.

ng periods of heavy rainfall, sewer systems col-
ng both sanitary wastes and stormwater over-
the treatment plant capacity and cause the
t discharge of an estimated 9.5 million lbs of
, 224 million lbs of suspended solids, 3.5 mil-
lbs of total phosphates, and 1.0 million lbs of
nitrogen to receiving waters in the District of
mbia. These estimates were obtained from ex-
ve sampling studies performed at three monit-
g installations in the District of Columbia dur-
969. The studies were performed to determine
haracteristics of stormwater run-off, both in
gated sewers and combined sewers. Results
ated that significant pollutional loads are
arged from both types of sewers. Four alterna-
methods of abating the pollution from storm-
r run-off include: (1) sewer separation; (2)
ystem storage; (3) in-line treatment, and (4)
ellaneous. However, based on the initial
lings separation was ruled out. The remaining
ods were analyzed according to the overall
irements for the entire area. Final costs esti-
s are not yet available, but these studies have
onstrated the feasibility of the regional
rage plant in this instance. (See also W71-
8) (Lowry-Texas)
-07986

DLE LEE SETS THE STANDARD,
r Beaumont.
eyor, Vol 136, No 4075, p 45-46, July 1970.

Descriptors: *Water quality control, *Domestic wastes, *Industrial wastes, Separation techniques, Sewage treatment, Activated sludge, Aeration, Filtration, Screens, Design criteria, Methane, Anaerobic digestion, Temperature, Biochemical oxygen demand, Fish, Toxicity, Water reuse, Tertiary treatment, Cost analysis, Waste water treatment, *Standards.
Identifiers: *River Lee, Suspended solids, Grit, Great Britain, BOD5.

New Town development in the Lee Valley caused great concern that the already overloaded River Lee would deteriorate further and become merely an open sewer. This problem was especially important because the River Lee empties into the Chingford Reservoir, which supplies 19% of the water supply of Metropolitan London. Final effluent standards set in 1955 required that the effluent contain less than 5 mg/l SS in summer, and 10 mg/l SS in winter, less than 5 mg/l BOD in summer and 10 mg/l BOD in winter, and a free ammonia content of less than 10 mg/l under both summer and winter conditions. Construction was accomplished in three stages, the first stage having a capacity for 8 mgd. Stage 2 was of the same size as stage 1, however, the plant capacity had to be redesigned before completion of stage 2. The final capacity of the finished plant was set at 30 mgd to compensate for rapid population growth. The treatment works consisted of screening, maceration, grit removal, and primary sedimentation. Secondary treatment of activated sludge using diffused air was provided, and tertiary treatment was assigned to rapid gravity sand filters. Primary and secondary sludge is digested anaerobically, and the sludge is distributed free as a top dressing or soil conditioner. Total plant cost was estimated at 6 million Pounds Sterling. Water quality rapidly improved after the new plant was put into operation, more than justifying the investment. (Lowry-Texas)
W71-07995

A MANAGEMENT ATTITUDE TOWARDS WATER CONSERVATION,
Shell Canada Ltd., Corunna (Ontario).
T. A. McIver.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 3-10, June 7-10, 1970.

Descriptors: *Oil wastes, *Phenols, Industrial wastes, *Management, Engineering education, *Water pollution control, Sedimentation, Flotation, Saline water, Sewers, *Waste water treatment.
Identifiers: *Segregated sewers, Canada.

The Shell Oil Company at Corunna uses 28 gallons of water for every gallon of crude processed, or 50 million Imperial gallons/day. The water is taken from the St. Clair river, and 95% is used once and returned to the river. The plant was constructed in 1952, and in 1955, the first biological treater for treating phenolic wastes in Canada was installed there. Since that time, in 1969, a larger API separator and trunk sewer line for oily water have been installed. A salt brine pond has also been constructed to prevent contamination of the river. The major reason for the small amount of pollution produced at the Corunna plant has been attributed mainly to good housekeeping within the plant itself. Education of all supervisory personnel on important factors of spillage prevention and control has significantly reduced both the oily discharges and the phenolic discharges from the plant. (Lowry-Texas)
W71-08001

CONSERVATION, RECLAMATION AND REUSE OF SOLIDS AND WATER IN POTATO PROCESSING,
Manitoba Univ., Winnipeg.
R. E. Gransfield, and R. A. Gallop.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 42-52, June 7-10, 1970.

Descriptors: *Industrial wastes, *Potatoes, Research and development, Pilot plants, Adsorption, Activated carbon, Microorganisms, Proteins, Water management (Applied), Sewers, Technical feasibility, Economic feasibility, *Water reuse, Waste water treatment.
Identifiers: *By-product recovery, *Waste stream segregation, Lye peeling, Stem peeling.

Waste water management in the potato industry must be more carefully controlled to stop unnecessary discharges of large quantities of water to receiving waters. Separation of sewers and by-products recovery of starch have recently come to light as possible pollution abatement techniques. At the present time, processing of 750,000 lbs of raw potatoes per day requires in excess of 1 MGD of water, with a similar waste water flow. Current research work being conducted in the area includes the development of the dry caustic peeling process, preparation of activated charcoal from waste potato solids, culturing of mixed microbial populations on solid potato wastes to produce high protein food supplements, and many others. The researchers at Manitoba University have also developed a chemical treatment process for potato wastes which is presently being tested on a pilot plant scale. Much further research work must be carried out before an optimal solution, both from the standpoint of technical and economic feasibility, can be reached. (Lowry-Texas)
W71-08004

APPLICATION OF AUTOMATIC SAMPLING TO TODAY'S WATER QUALITY CONTROL PROGRAMS,
Gurnhamand Associates, Inc. Chicago, Ill.
Fred C. Gurnham, and Martha I. Beach.
Proceedings, Ontario Industrial Waste Conference, 17th, Niagara Falls, Ontario, p 109-118, June 7-10, 1970.

Descriptors: *Sampling, *Automatic control, Analytical techniques, Analysis, *Monitoring, Dissolved oxygen, Temperature, Flowmeters, Pumps, Weirs, *Water pollution control, Hydrogen ion concentration.
Identifiers: *Pump sampler, *Scoop sampler, Vacuum sampler.

The following variables must be considered in the selection of automatic sampling equipment: (1) accessability of sampling site; (2) general character of the wastes; (3) flow patterns; and (4) analyses to be performed. To accommodate the preceding variables, there are 6 main types of samples, namely: (1) individual or 'grab'; (2) simple composite; (3) sequential composite; (4) continuous; (5) hand proportioned composite; and (6) automatic proportioned composite. Sampling equipment ranges in price from a few dollars to several thousand dollars, and in size from the portable to the permanent models. A brief description of the various samplers includes vacuum or compression samplers fixed volume and scoop samplers, cup or bucket elevator samplers, and pump samplers. The important service provided by a sampling schedule must include production of a sample of adequate size, provision for preservation, and provision for containment until analyses can be performed. Growing concern with environmental pollution has caused much interest in monitoring pollutional parameters, but without a representative sample, all analyses performed are merely wasted. Therefore, specification, installation, and operation of automatic sampling devices must be considered a critical part of any waste survey. (Lowry-Texas)
W71-08008

MINEWATER TREATMENT-INCO SUDBURY DISTRICT OPERATIONS,
International Nickel Co., of Canada Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 05D.
W71-08009

TECHNIQUES OF DEEP WELL DISPOSAL-A SAFE AND EFFICIENT METHOD OF POLLUTION CONTROL,
American Industrial Disposal System Inc., Pittsburgh, Pa.
Robert S. Stewart.
Proceedings, Ontario Industrial Waste Conference, 15th, p 37-43, June 9-12, 1968. 1 fig.

Descriptors: Water pollution control, *Deep wells, Geologic formations, Saline water, Gas, Oil, Cementing, Casing, Costs, *Waste water disposal.

The basic requirements for a deep well disposal system are: a subsurface horizon, preferably of sand stone filled with salt water, and located at a sufficient depth and suitable geological sequence so there might be no contamination of any water sources. The primary disadvantage or danger of the deep well disposal is the pollution of groundwater which could be limited through original program design. The techniques of drilling a deep well disposal system and equipping it in a satisfactory manner are derived from the oil and gas industry but with the primary concern that this well should be free of any possible defects that could allow contamination of potable water or mineral sources. This could be achieved by an elaborate control over the drilling, casing and cementing program. A schematic diagram showing all these factors is given. In general the cost of the deep well disposal is about one third of any other method of neutralization. (Rayyan-Texas)
W71-08015

INCINERATION OF PROCESS INDUSTRY WASTES,
Trecan Ltd., Cooksville (Ontario).
W. K. Lombard.
Proceedings, Ontario Industrial Waste Conference, 15th, p 43-60, June 9-12, 1968.

Descriptors: *Incineration, *Wastes, *Oxygen, Temperature, Turbulence, Liquids, Costs, Fuels, Disposal, *Waste treatment, *Waste disposal, Waste water treatment.

Combustion, or incineration is one of the effective methods of disposal of industrial wastes. Analysis of the wastes involved could determine the possibliity of this method. Incineration equipment should have air for oxygen and temperature, turbulence and time for good combustion. The types of wastes that could be handled by this method are: (1) rich liquids, (2) weak liquids, (3) halogenated liquids, (4) fumes and high heating, volume bulk materials. These wastes along with the suitable incinerator are discussed in detail including cost. An example of the cost range for a rich liquids incinerator of a 500 lb/hr burning capacity is $10-15,000 while the cost of a 2000 lb/hr weak liquids incinerator is $35-40,000 and would require 8 million BTU/hr of auxiliary fuel. Heat recovery from these incinerators is recommended only if the savings or by-products created will pay for the additional initial cost in no more than one year. An example case of a central disposal facility which is being constructed at Moore on the St. Clair river is reviewed. (Rayyan-Texas)
W71-08016

PILOT PLANT STUDIES ON COMBINED DOMESTIC AND PAPER MILL WASTES,
O'Brien and Gere, Syracuse, N.Y.
For primary bibliographic entry see Field 05D.
W71-08017

ACTIVATED SLUDGE SYSTEM VARIATIONS, SPECIFIC APPLICATIONS,
Associated Engineering Services Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 05D.
W71-08018

NEW APPROACHES TO WASTE WATER TREATMENT,
Cincinnati Water Research Lab., Ohio.
For primary bibliographic entry see Field 05D.
W71-08019

SEWER FLOW MEASUREMENT IN A LARGE INDUSTRIAL PLANT,
Polymer Corp., Sarina (Ontario).
D. D. Livingstone.
Proceedings, Ontario Industrial Waste Conference, 15th, p 146-156, June 9-12, 1968. 8 ref.

Descriptors: Treatment facilities, Survey, *Measurement, *Sewers, *Flow rate, Velocity, Costs, Sedimentation basin, *Current meter.

For accurate design of new pollution control facilities, and more accurate measurement of the actual performance of the treatment facilities, a survey scheme was developed in 1967 to measure all important discharges and identify the sources of these streams. The allowable error was 10%. Description of the plant and the treatment facilities with a plan layout is given. A recommended eight point survey plan is outlined. The measurement equipment used in this survey was the portable type, at a cost less than $500. The Doll flow tube, the current meter, the pilot tube, bucket and stop watch (bucket was used for settling basin) and the salt dilution methods gave the required results within the allowable error and at a low cost. (Rayyan-Texas)
W71-08020

THE ECONOMICS OF ALTERNATIVE METHODS OF WHEY DISPOSAL AT SOUTHERN ONTARIO CHEESE FACTORIES,
Ontario Dept. of Agriculture and Food, Toronto.
R. W. Redelmeier, and D. A. MacDonald.
Proceedings, Ontario Industrial Waste Conference, 15th, p 157-202, June 9-12, 1968. 8 tab, 14 ref.

Descriptors: *Nitrogen, *Hogs, *Waste disposal, Pollution disposal, Drying, Costs, Fertilizer, Foods, Water pollution control.
Identifiers: Whey, Cheese, Lactose, Spray drying, Roller drying.

Whey is the residual by-product in cheese making. It is 93% water, 4.9% lactose, .9% nitrogenous matter, .6% ash, .3% fat, and .2% lactic acid. For every 100 lbs milk used, 90 lbs are whey. Ontario produces one billion pounds of whey annually. Disposal of whey as hog feed and as waste is decreasing. Other advantageous methods of disposing of whey without causing pollution problems are spray or roller drying. An adequate supply of quality whey within reasonable trucking distance and sufficient demand at attractive prices for whey products are the conditions for satisfactory whey drying operations. Cost of whey drying ranges from $30,000 for roller drying with a capacity of 27,000 lbs to $1,055,000 for spray drying with a capacity of one million lbs. A variety of new whey products have been developed in Europe (vinegar and beverages). Research work on whey is under way in Canada, while in the U. S. considerable research has been done on the use of whey as an ingredient in the bakery industry, frozen food and related fields. By 1965, 100 whey processing plants existed in the U. S. However, further research is warranted not only on the production aspects of whey but on their marketing potential including consumer acceptance. (Rayyan-Texas)
W71-08021

PHOSPHATE REMOVAL BY ACID HYDROLYSIS AND CHEMICAL PRECIPITATION,
Ryckman, Edgerly, Tomlinson and Associates, Inc., St. Louis, Mo.
For primary bibliographic entry see Field 05D.
W71-08022

DEFINING THE PROBLEM FOR INDUSTR WASTE HANDLING AT HIRAM WALKER SONS LTD.,
Hiram Walker and Sons Ltd., Toronto (Ontario
Murray Sobolov.
Proceedings, Ontario Industrial Waste Confere 15th, p 223-249, June 9-12, 1968. 12 tab.

Descriptors: *Sewers, *Measurement, Samp Effluents, Disposal, Biochemical oxygen dem Industrial wastes, Water pollution control, W pollution sources, Routing.
Identifiers: Suspended solids, *Sewer rerouting

To assist in pollution control, Hiram Walker Sons Ltd, analyzed their 110 year old factori uncover all sources of pollution. Drawings sho the sewer system were produced with the build contributing to the pollution. Sampling and measurements were taken. An explicit discus on the above two points supported by tables curves is presented. As a result, control of poll will be handled by rerouting some sewers, a ch of production equation, and collecting all poll effluents in a control collection system which will flow to the city disposal plant. The rema effluent which is about 75-80% of the total a almost BOD free will be discharged in the r (Rayyan-Texas)
W71-08023

PALMER CORPORATION V COLLINS (C TAMINATION OF OIL BY WATER SEEP FROM NEGLIGENTLY ABANDONED WELL).
For primary bibliographic entry see Field 06E.
W71-08055

NORTHRUP V CITY OF JACKSON (AB MENT OF MUNICIPAL WASTE POLLUT AND DAMAGES).
For primary bibliographic entry see Field 06E.
W71-08079

WATER QUALITY EVALUATION OF MIDDLE RIVER ROUGE BASIN.
Michigan Water Resources Commission, Lan Dept. of Conservation.
For primary bibliographic entry see Field 05A
W71-08128

OIL EXPLORATION ON GREAT BAR REEF,
Queensland Littoral Society, Brisbane (Austra
D. W. Connell.
Marine Pollution Bulletin, Vol 1 (NS), No 188-189, Dec 1970. 2 fig, 1 tab, 3 ref.

Descriptors: *Leases, *Oil fields, *Drilling, *E Exploration, Environmental effects, Oil, Wate lution control.
Identifiers: *Great barrier reef, Australia.

The Royal Commission hearings into Great B Reef Oil Drilling have been underway since 1970 in Brisbane, Australia. A map produc the Queensland Mines Department is present show the location relationship of offshore lea the reef, with the lease boundaries for the mos following the outer line of the reef. A signi Royal commission definition of the area c Great Barrier Reef included the area outsid outer line of reefs. Potential offshore hydroc bearing basins are illustrated with a Geologica vey of Queensland map. A table consisting hydrocarbon potential of each basin is given cEntry-PAI)
W71-08156

DISPOSAL OF RADIOACTIVE WASTE F WINDSCALE,
Ministry of Agriculture, Fisheries and Lowestaft (England). Fisheries Radiobiol Lab.
N. T. Mitchell.

ine Pollution Bulletin, Vol 1 (NS), No 11, p 174, Nov 1970. 1 fig, 7 ref.

criptors: *Radioactive waste disposal, *Water ution sources, *Critical path method, *Water nits, *Regulation, Standards, Fuels, Nuclear es, Radioactive wastes, Effluents, Discharge, te water.
tifiers: *Windscale, *Irish Sea, *Reprocessing , Great Britain, Seaweed contamination, EA, MHLG, MAFF.

UKAEA's nuclear fuel reprocessing plant at lscale reprocesses all fuel from nuclear power ns operated by the CEGB and the South of land Electricity Board. The fuel is dissolved, nically separated, evaporated to a small ne, and stored on the site. Some low level e which accrues in large volumes of water is sed of into the Irish Sea. Control of these sea sals lies with the MHLG and the MAFF, h set strict authorization limits to minimize activity exposure. The procedure is described eby the UKAEA requested an increase in the of disposal authorized for alpha radioactivity. intensive environmental monitoring and rch program utilizes the critical path ap- ch which evaluates the environmental vior of the radioactivity discharged. The criti- pathway at Windscale for alpha and beta activity is contamination of Porphyra seaweed h is manufactured into laverbread eaten ly in South Wales. Other less important expo- pathways are contamination of mud banks and umption of locally caught fish. Actual radia- exposure in all these cases has been well within CRP recommendations. (McEntyre-PAI)
-08161

GNETIC SYSTEM PICKS UP OIL FROM LS.

nical and Engineering News, Vol 49, No 5, p 8.

riptors: *Oil wastes, *Magnetic studies, ipment, Water pollution control, Oil, *Pollu- abatement.
tifiers: *Ferrofluids, *Magnetic cleanup, Oil , Magnets, Avco Corporation.

Corporation is developing a magnetic up of oil spills by using a ferrofluid consisting colloidal suspension of magnetic iron oxide in a hydrocarbon carrier oil such as kerosine. This oluble, water-insoluble ferrofluid solution uces a magnetic response due to the coupling magnetic particles with the surrounding carri- quid. Thus when the ferrofluid solution is ed on oil slicks, the magnetic properties are erred upon the oil phase so that a collecting et picks up oil with very little water entrained. oil which accumulates between the magnet is collected with a vacuum hose and pumped containers. Operative predictions for this m project a harvesting of 16 acres of oil slick hour, or 12,500 gallons of oil of 1 mm. ness, at a cost of less than $1.00 per gallon. her application of this ferrofluid system is for ication of oil refinery effluent streams. (M- yrc-PAI)
-08163

TOTYPE SYSTEM CONTAINS AND OVES OIL FROM WATER.

n Industry, Vol 6, No 1, p 19, Jan 1971.

riptors: *Oil wastes, *Separation techniques, pment, *Water pollution control, Oil, *Pollu- abatement.
ifiers: Oil spills, *Oil recovery system, drick Industries Inc.

mplete open-ocean oil recovery system has developed and tested by Headrick Industries, near Coal Oil Point, California. Included in system are booms, towing harness, recovery and transport vessel, and fabric tank. A description is given of the testing of the system. The oil separation technique involves flow of a controllable and limited surface depth of water into an unagitated gravity separator where the oil is then skimmed off the surface and transferred to the oil storage tank. This recovery system can operate in varying slick and sea state conditions, with a maximum oil transfer capacity of 800 to 1500 gallons per minute. (McEntyre-PAI)
W71-08164

INFORMATION AVAILABLE ON DISPOSAL OF SURPLUS PESTICIDES, EMPTY CONTAINERS AND EMERGENCY SITUATIONS.
Working Group on Pesticides, Washington, D.C.

Available from the National Technical Information Service as PB-197 146, $3.00 in paper copy, $0.95 in microfiche. Working Group Report DR-3, Sept 1970.

Descriptors: *Pesticides, *Insecticides, *Waste disposal, Herbicides, Water pollution treatment, Landfills, Solid wastes, Sewers, Lagoons, Injection wells, Industrial wastes, Incineration.
Identifiers: *Containers, Earth fills, Agricultural wastes, Air pollution control equipment, *Solid waste disposal, Sanitary landfills.

The information available on research in progress and recommendations on disposal methodology, pinpoint problem areas related to the disposal of surplus pesticides, wastes and empty containers in the first chapter. Sources of wastes, definitions for various disposal methods such as deep-well, sanitary landfill, disposal pits, lagoons, surface or ground disposal, etc., estimates of number of empty containers, and a list of companies who manufacture incinerators and flue gas scrubbers are included in its appendixes. Detoxification, handling, reconditioning and reuse of empty 55-gallon pesticide drums including decontamination by chemicals, decontamination by incineration and information needed on decontamination and drum reuse are presented in Chapter II WITH A LISTING OF FIRMS HAVING BURNING EQUIPMENT. Storage and handling pesticides and empty containers form Chapter III. Chapter IV is on detoxification of decontamination of transportation equipment and disposal and handling of pesticides or wastes resulting from accidents. Chapter V includes emergency assistance information and methods and an appendix on the National Agricultural Chemicals Association pesticide safety team network. Written by four authors from different federal agencies who formed a task group.
W71-08173

CENTRAL FRESNO COUNTY WATER AND LIQUID WASTE PROGRAM,
Fresno County Planning Dept., Calif.

Available from the National Technical Information Service as PB-197 507, $3.00 in paper copy, $0.95 in microfiche. Grunwald, Crawford and Associates-Engineering Science, Inc. Summary Supplement Report, Mar 1970. 7 p.

Descriptors: *Regions, California, *Water supply, *Waste disposal, Sewers, Groundwater, Urbanization, Economic aspects, Water reuse, Industrial wastes, Sewage treatment.
Identifiers: *Regional planning.

The primary objective of the Water and Liquid Waste Program for the Central Fresno County Urbanizing Area has been to develop short-, medium-, and long-range programs for providing water supply and sewerage facilities from 1970 to 2015. A major emphasis of the study has been related to the protection of public health and the maintenance of groundwater quality and quantity in future years. The presentation which follows is a summary of the major findings, conclusions, and recommendations of the report with regard to (1) future growth requirements, (2) significant features of recommended water and sewerage systems, (3) the indicated financial requirements, and (4) considerations for implementing the recommended program.
W71-08176

CENTRAL FRESNO COUNTY WATER AND LIQUID WASTE PROGRAM. VOLUME V. MATHEMATICAL MODEL FOR GROUNDWATER.
Fresno County Planning Dept., Calif.
For primary bibliographic entry see Field 06B.
W71-08179

DOCUMENTATION REPORT--FWQA DYNAMIC ESTUARY MODEL,
Environmental Protection Agency, Washington, D.C. Water Quality Office.
Kenneth D. Feigner, and Howard S. Harris.
Available from the National Technical Information Service as PB-197 103, $3.00 in paper copy, $0.95 in microfiche. July 1970. 248 p, 50 fig, 7 tab, 22 ref, 1 append.

Descriptors: *Mathematical models, *Estuaries, *Computer programs, *Hydraulic models, *Water quality, Dynamics, Flow, Dispersion, Biochemical oxygen demand, Dissolved oxygen, Regression analysis, Input-output analysis.
Identifiers: San Francisco Bay, San Diego Bay.

The necessary theory, background, and guidelines for applying the FWQA dynamic estuary model to an arbitrary estuary was presented. The discussion reflected FWQA experience in applying the model to the San Francisco and San Diego Bay estuaries. The model was utilized to simulate a wide variety of hydraulic and water quality conditions in these two systems, and through the course of its development, testing, and use, under-went significant change. The model represented the two-dimensional flow and dispersion characteristics of an estuary and could be applied to any estuary wherein vertical stratification was either absent or limited to relatively small areas within the estuary. The model could accommodate both conservative constituents including the interrelationship between biochemical oxygen demand (BOD) and dissolved oxygen (DO). Two separate, but compatible components were developed: a hydraulic program (DYNHYD) and a quality program (DYNQUA). A third program, a harmonic regression analysis (REGAN) was utilized to reduce input requirements for specifying the tidal conditions imposed on the system. A hydraulic extract program (HYDEX) summarized the hydraulic output while a quality extract program (QUALEX) summarized the output from the quality program. A final program (DATAP) was developed to prepare basic inputs to the hydraulic program. (Kriss-Cornell)
W71-08189

APPLICATION OF USER CHARGES TO WATER QUALITY MANAGEMENT,
Chicago Univ., Ill. Graduate School of Business.
Charles Upton.
Water Resources Research, Vol 7, No 2, p 264-272, Apr 1971. 9 p, 4 tab, 15 ref.

Descriptors: *Optimization, *Taxes, *Water quality control, *Costs, Pollutants, Dissolved oxygen, River basins.
Identifiers: *User charges, Miami River.

The relative effects of optimal taxes and user charges were investigated for the Miami River basin in Ohio, and the user charges appeared preferable to the optimal tax. First, some previous studies and the geography of the Miami River basin were discussed. For the model three functions were estimated: the cost of treatment for each plant, the cost augmentation, and the water quality function. It was shown that the authority will incur a loss if the optimal tax was used and this deficit makes them undesirable. With the alternative of user

charges each firm that discharges pollutants pays a 'share' of the cost of centralized treatment. Two schemes were proposed to determine what share of the costs would be borne by each firm: (1) increased permissible waste load method, and (2) waste load discharge method. The effect of different choices for the water quality standard was examined by computing 11 levels of dissolved oxygen for the Miami River. The minimum cost of meeting each of the standards was calculated and the efficient production locus was thus obtained. If taxes were levied to achieve the minimum cost of water quality standard, the receipts would pay about 85% of the cost. User charges would erase this deficit at an additional total cost of only about 1 percent. (Kriss-Cornell)
W71-08196

CHEBYSHEV OPTIMAL WASTE DISCHARGES,
Yale Univ., New Haven.
Matthew J. Sobel.
Supported by National Science Foundation. Operations Research, Vol 19, No 2, p 308-322, Mar-Apr 1971. 15 p, 11 ref.

Descriptors: *Optimization, *Waste treatment, *Water quality, *Storage capacity, Linear programming, Dynamic programming, Discharge measurement, Water resources.
Identifiers: *Chebyshev criterion.

A model for evaluating alternative schedules for storing wastes and discharging stored wastes into a water resource was provided. The central problems were (1) for a given capacity, what discharge schedule maximizes the minimum water quality during a finite horizon, and (2) for a given minimum water quality during a finite horizon, what is the smallest storage capacity for which there exists a feasible discharge schedule. Problem (1) used a Chebyshev criterion where the problem was to find a point in the domain that minimized the maximum among the functions (or maximized the minimum among the functions). The suitability of a Chebyshev criteria for water quality problems was discussed. Then problems (1) and (2) were given deterministic formulations and the terminology of a holding-pond problem was used for ease of exposition. The nonlinear-programming problems based on (1) and (2) shared a base-level property and the computational consequences were developed including a simple algorithm for problem (2). A special case when the programming problems were linear and seasonal was investigated. Problems (1) and (2) were also posed as dynamic programming problems in order to prove the existence of an optimal discharge schedule possessing the base-level property. (Kriss-Cornell)
W71-08197

DESIGN OF SEWER SYSTEMS,
Wisconsin Univ., Milwaukee. Coll. of Applied Science and Engineering.
J. M. Fisher, G. M. Karadi, and W. W. McVinnie.
Water Resources Bulletin, Vol 7, No 2, p 294-302, Apr 1971. 9 p, 4 fig, 7 ref.

Descriptors: *Optimization, *Linear programming, *Sewers, *Design, *Cost, Pipes, Constraints, Depth, Slopes, Size.
Identifiers: Iteration process, Algorithms.

The objective of this paper was to review and evaluate the merits of certain methods aimed at finding optimal solutions in sewer design. First, basic principles of sewer design were outlined. Then a linear integer programming algorithm, based on principles similar to the ones proposed by Deininger and Holland, was developed in which cost was expressed as a function of the pipe diameter and slopes. In order to show the application of the programming algorithm and to find out what difficulties are encountered in an actual problem, it was applied to an existing design of an interceptor sewer to be built in the Chicago metropolitan area and composed to a traditional approach. A computer program based on the SIMPLX method was developed to find the optimum pipe diameter, invert depths and slopes based on the objective cost function and subject to certain given constraints. An iteration process was used for the solution. The results of the optimization were summarized and a 10% difference was found between the results of the new algorithm and results of the traditional approach shown. In conclusion it was stated that this new optimization technique cannot be considered as substantial improvement with respect to traditional methods. (Kriss-Cornell)
W71-08199

FARM ANIMAL-WASTE MANAGEMENT.
Iowa State Univ., Ames. Dept. of Agricultural Engineering.

Miner, J Ronald (Ed). North Central Regional Publication 206, Special Report 67, May 1971. 44 p, 34 tab, 85 ref.

Descriptors: *Farm wastes, *Disposal, Waste water treatment, *Management, Hydroponics, Incineration, Pollutants, Diseases, Design criteria, Anaerobic digestion, Aerobic treatment, Aerobic bacteria, Zoonoses, Anaerobic bacteria, Farm lagoons, Chemical properties, Physical properties, Pathogenic bacteria, Environmental effects.
Identifiers: Composting, Oxidation ditches, Ruminant digestion, Nonruminant digestion, Disease transmission, Feedlot-runoff.

Current practices, technology, knowledge, and research results are summarized as related to the management and disposal or use of farm animal wastes in the 13 states of the North Central Region and other cooperating states. Among alternative systems of management and treatments described, attention is given to relative effectiveness in eliminating or minimizing detrimental environmental and ecological consequences. Detailed information is included on the biology and biochemistry of waste treatments; characteristics of animal wastes, including biological, physical, and chemical properties; aerobic, anaerobic, and combined treatments of animal wastes; composting, incineration, dehydration, and hydroponics; and actual and potential productive utilization of animal wastes. Needs for additional research are suggested. (Christenbury-Iowa State)
W71-08209

LEGAL ASPECTS PERTAINING TO ENVIRONMENTAL REGULATIONS IN PORK PRODUCTION,
Missouri Univ., Columbia. Dept. of Agricultural Economics.
Donald R. Levi.
American Pork Congress - Proceedings, Environmental Quality Workshop, Des Moines, Iowa, Mar 3, 1971. p 103-111.

Descriptors: *Farm wastes, *Legal aspects, Water pollution, Air pollution, Public rights, Regulation, Judicial decisions, Damages, Zoning, Permits, Maintenance, Water pollution control.
Identifiers: Public regulation, Private regulation, Nuisances, Legal principles, Lawsuits, Liability, Actual damages, Punitive damages, Site selection.

Public and private regulation of both air and water pollution is provided by pollution boards or commissions and through nuisance laws. Two lawsuits are discussed so that the legal principles involved might help determine what courses of action will help avoid such situations. In a nuisance law case the complaining party may ask for (1) an injunction, (2) damages (either actual or punitive), or (3) both an injunction and damages. The nuisances involved may be either public or private. A plaintiff may have a better chance if the rights of the public are being affected. Methods of avoiding lawsuits include the use of zoning, site selection, licensing, proper maintenance, adequate facilities, and being a 'good neighbor.' (White-Iowa State)
W71-08210

CONFINEMENT REARING OF TURKEYS,
Amerine National Corp., Oakdale, Calif. Hasti
Div.
Douglas C. Ferebee.
Poultry Digest, p 110-112, Mar 1971. 2 fig.

Descriptors: *Ventilation, *Management, *C
finement pens, Farm wastes, Equipment, Hazar
Poultry, Water pollution control.
Identifiers: *Psychrometric chart, Overventilati
Turkeys.

Some management functions that can lead to m
imzing returns from turkey production
discussed. To get the most out of any ventilat
system, whether it is positive or negative pressu
knowledge of psychrometrics by the person do
the ventilating is essential. It is possible to overv
tilate a total confinement house or to underve
late it. Much can be gained from having th
mostats located outside where outdoor conditi
can be used to provide a better environment insi
Good, not necessarily new, in-house equipmen
vital for optimum results from confinem
production. (Christenbury-Iowa State)
W71-08212

**HOW CAN PORK PRODUCERS COMP
WITH ENVIRONMENTAL QUALITY STA
DARDS,**
Iowa State Univ., Ames. Dept. of Agricultural
gineering.
For primary bibliographic entry see Field 05D.
W71-08214

**THE EFFECTS OF SALINITY STANDARDS
IRRIGATED AGRICULTURE IN T
COLORADO RIVER BASIN,**
Federal Water Pollution Control Administrati
Boulder. Colorado River - Bonneville Basins
fice.
Gary N. Dietrich, and L. Russell Freeman.
In: Water Quality Management Problems in A
Regions, Water Pollution Control Research Ser
13030 DYY, 6/69, Oct 1970, USDI, Federal Wa
Quality Administration, p 9-15.

Descriptors: *Salinity, *Water quality, *Standa
Colorado River, *Irrigation, Evapotranspirati
Desalination, Flow augmentation, Consumpt
use, Water pollution effects.
Identifiers: *Salinity criteria, Irrigation cy
Salinity-source abatement.

This paper discusses salinity criteria for
Colorado River Basin. The problem faced in wa
quality management in the Colorado River Basi
one of improving existing mineral quality, o
least, minimizing future salinity increases. C
sumptive use of water in crop production co
plicates developing salinity criteria for
Colorado River Basin. There are only two di
approaches to implementing salinity criteria:
regulation of consumptive water uses and
desalination of waters whose salinity has been c
centrated by consumptive use. Three salinity c
trol approaches which do not necessarily dep
on the establishment of criteria are: the abatem
of salinity at selected sources including nat
sources, the augmentation of river flows, and
desalination of water for use. (See also W
06111) (White-Iowa State)
W71-08222

**NITRATE REMOVAL FROM AGRICULTUR
WASTE WATER,**
Federal Water Pollution Control Administrati
Fresno, Calif.; and California Dept. of W
Resources, Fresno.
For primary bibliographic entry see Field 05D.
W71-08223

**WATER QUALITY REQUIREMENTS AND
USE OF WASTE WATER EFFLUENTS,**
Federal Water Pollution Control Administrat
Washington, D.C.
For primary bibliographic entry see Field 05D.

-08224

INITY CONTROL IN RETURN FLOW M IRRIGATED AREAS - A DEMONSTRA- N PROJECT,
rado State Univ., Fort Collins. Natural urces Center.
nan A. Evans.
Water Quality Management Problems in Arid ons, Water Pollution Control Research Series, 0 DYY, 6/69, Oct 1970, USDI, Federal Water ity Administration, p 45-55. 7 fig.

riptors: *Salinity, *Return flow, *Irrigation, rado River, Salt balance, Canal seepage, Deep olation, Evapotranspiration, Electrical con- nce, Base flow.
ifiers: Salt load.

purpose of this paper was to summarize a nstration project which has been initiated in rand Valley area of Colorado for the purpose owing that saline agricultural return flows are ollable and that if improvements in water gement practices are applied, the salt load ning to the river will be reduced. A discussion en on the mechanics of return flow. Six irriga- ompanies, a power company, and a drainage ct combined resources to form a corporation he purpose of conducting the demonstration tudy. The first step was a before treatment in- ry of water and salt budget in the demonstra- area. Canal seepage losses have been mea- and a plan for lining certain sections is being lated. Many water flow measurements are made. Evapotranspiration estimates will be Groundwater flow will be calculated from ulic gradient and permeability data. Self- oring the Colorado River will afford the final nce of positive benefit from reduction in canal ge. The reduced canal seepage should reduce the volume of return flow, and affect a sig- nt reduction in salt load. (See also W71-) (White-Iowa State)
08225

ER QUALITY CONTROL PROBLEMS IN ND SINKS,
al Water Pollution Control Administration, eda, Calif. California/Nevada Basins.
rd C. Bain, Jr., and John T. Marlar.
ater Quality Management Problems in Arid ns, Water Pollution Control Research Series, DYY, 6/69, Oct 1970, USDI, Federal Water y Administration, p 57-77. 8 fig, 2 tab, 10 ref.

iptors: *Water quality, *Salinity, *Sinks, phication, Fish, Dissolved oxygen, Tempera- Nutrients, Evaporation, Water level fluctua- Nevada, California.
fiers: Pyramid Lake (Nev), Salton Sea), Total dissolved solids, Surface area.

roblems of Pyramid Lake, Nevada, and Sal- a, California, are similar in many ways and ommon to other inland sinks. Salinity in- s and water level fluctuations attributable to and salt inflows and evaporation losses may ntrolled or abated through river basin and quality management schemes. Pyramid Lake levels and the rate of salinity increases can be lled by increasing the water supply to the Salton Sea salinity and water level problems better controlled by salt extraction, lower ir- n efficiencies in nearby agricultural areas, eading on developed parts of the shore, and le future evaporation pond operation. phication symptoms, advanced in the Salton d emerging in Pyramid Lake, are less easily ulated. Natural forces of deposition and con- ion of organic matter within these waters will o limit nutrient buildup; however trapping edation effects alone will not eliminate algal s. Control of eutrophication must begin with l or elimination of major nutrient sources. It r that unless water quality control measures ken, both bodies of water will eventually e aqueous deserts. Local, State and Federal efforts are underway to preserve or enhance the water quality and associated uses of these two in- land sinks. (See also W71-06111) (White-Iowa State)
W71-08226

DISTILLATION OF WASTE WATERS: A WATER RESOURCE FOR ARID REGIONS,
Federal Water Pollution Control Administration, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 05D.
W71-08227

THE REFUSE ACT OF 1899: NEW TASKS FOR AN OLD LAW,
For primary bibliographic entry see Field 06E.
W71-08228

MICHIGAN ENVIRONMENTAL PROTECTION ACT OF 1970,
For primary bibliographic entry see Field 06E.
W71-08230

EFFLUENT CHARGES: WATER POLLUTION CONTROL,
For primary bibliographic entry see Field 06E.
W71-08231

THERMAL POLLUTION: THE ELECTRICAL UTILITY INDUSTRY AND SECTION 21 (b) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
For primary bibliographic entry see Field 06E.
W71-08232

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO CHANGE THE TREATMENT WORKS CONSTRUCTION PROGRAM.
For primary bibliographic entry see Field 06E.
W71-08234

OILY-WATER SEPARATORS AND SEWAGE DISPOSAL SYSTEMS: VESSEL REQUIREMENTS.
For primary bibliographic entry see Field 06E.
W71-08239

STANDARDS FOR PROTECTION AGAINST RADIATION.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-08242

NATIONAL MARINE WATERS POLLUTION CONTROL AND QUALITY ENHANCEMENT ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 06E.
W71-08247

THE ROLE OF THE COURT IN PROTECTING THE ENVIRONMENT--A JURISPRUDENTIAL ANALYSIS,
For primary bibliographic entry see Field 06E.
W71-08249

ENVIRONMENTAL LAW--NUISANCE--INJUNCTIVE RELIEF DENIED IN PRIVATE ACTION FOR NUISANCE CAUSED BY INDUSTRIAL POLLUTER.
For primary bibliographic entry see Field 06E.
W71-08250

ENVIRONMENTAL REPORTS FOR NUCLEAR POWERPLANTS.
Atomic Energy Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-08251

ENVIRONMENTAL QUALITY.
Department of Agriculture, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-08252

OIL POLLUTION FROM SHIPS,
For primary bibliographic entry see Field 06E.
W71-08253

ENVIRONMENTAL LITIGATION--WHERE THE ACTION IS,
For primary bibliographic entry see Field 06E.
W71-08256

AN ACT RELATING TO THE PUBLIC AND ENVIRONMENTAL HEALTH AMENDING THE FLORIDA AIR AND WATER POLLUTION CONTROL ACT BY PROVIDING ADDITIONAL GROUNDS FOR INJUCTIVE RELIEF.
For primary bibliographic entry see Field 06E.
W71-08258

AN ACT RELATING TO THE DEPARTMENT OF AIR AND WATER POLLUTION CONTROL: ENFORCEMENT PROCEDURE FOR TEMPORARY AND NON-CONTINUING VIOLATIONS.
For primary bibliographic entry see Field 06E.
W71-08259

THE ECONOMICS OF POLLUTION AND THE INTERDISCIPLINARY APPROACH TO ENVIRONMENTAL PLANNING,
Technische Hochschule, Darmstadt (West Germany).
For primary bibliographic entry see Field 06A.
W71-08264

WATER QUALITY STANDARDS: ENFORCEMENT AND COMPLIANCE,
Federal Water Quality Administration, Washington, D.C.
Murray Stein.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 157-181, 1971.

Descriptors: *Water law, *Water Quality Act, *Regulations, *Thermal powerplants, Legislation, Water pollution control, *Standards.
Identifiers: Law enforcement, Temperature criteria.

The author presents the policy of the Federal Water Quality Administration and the Department of the Interior in the procedures for establishment of water quality standards and means of their enforcement in the USA. The Federal Water Quality Administration's concern is that all types of power generating units should be subject, insofar as practicable, to regulation on a similar and nondiscriminatory basis with respect to other industrial processes. All of the states included temperature criteria as part of their water quality standards submissions. Administration legislative proposals are also presented together with certification of standards compliance and the Water Quality Improvement Act of 1970. The three stage enforcement procedure - the conference, the public hearing and court action - is presented through the example of Biscayne Bay pollution with thermal discharges from one of Florida's power plants. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08305

PRACTICAL IMPLICATIONS OF APPLYING CRITERIA IN A VARIETY OF CONDITIONS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
R. E. Johnson.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 183-187, 1971.

Descriptors: *Thermal pollution, *Thermal powerplants, *Environmental effects, Water quality control, Heat, Beneficial use, *Standards.

The conglomeration of water standards admittedly is troublesome but may be inevitable. The attitude toward more rigid, higher standards is justified by our insufficient knowledge and the fact that we cannot afford risks with the biota. The destruction of an aquatic or terrestrial community by some environmental change may not seem important at times, but the community may not be replaceable in that area. The author polemizes with some of the popularized views pointing out that, for example, even brief entrainment of organisms through a cooling system may be harmful some distance below the discharge, or that heat is not always the only concern with metal ions and biocides present; or, that in some instances a few degrees of rise in water temperature can change a desirable fish fauna into an unacceptable group of species. There will never be a better time to plan, design and construct for future needs. The cost will never be lower and the long-term benefits will never be greater. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08306

DEVELOPING AND APPLYING STANDARDS AT THE STATE LEVEL,
Pennsylvania Dept. of Health, Harrisburg. Div. of Water Quality.
R. M. Boardman.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 213-227, 1971. 2 ref.

Descriptors: *Standards, *Regulations, *Temperature, *Thermal pollution, *Cooling water, *Water quality control, Fish, Biota, Surface waters, Thermal powerplants, Nuclear powerplants, *Pennsylvania.
Identifiers: *Susquchana River, Fish pathways.

Pennsylvania's Sanitary Water Board thermal discharge regulations, adopted in 1961, are presented, followed by the discussion of water quality standards included in the amendment adopted in 1965. The heat content of discharges shall be limited to an amount that could not raise the temperature of the entire stream at the point of discharge 5F above ambient temperature or maximum of 87F, whichever is less; nor change the temperature by more than 2F during any one hour period assuming complete mixing. For a stream capable of supporting a cold water fishery, the maximum temperature is 58F, the increase remaining 5F. A fishway will be required in streams receiving heated discharges where this is essential for preservation of migratory pathways of game fish or for preservation of important aquatic life. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08308

ENVIRONMENTAL INFLUENCE ON POWER OPERATION,
American Electric Power Service Corp., New York.
John Tillinghast.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 281-294, 1971.

Descriptors: *Water law, *Regulations, *Thermal powerplants, *Thermal pollution, Cooling, Heat, Environmental effects, Economic feasibility, Standards, Nuclear powerplants, Lake Michigan, Ohio River.

Due to low electric generation efficiencies, up to 75% of the potential chemical energy fails to be converted to electricity and must be rejected to the environment in the form of heat. Public opinion cannot expect power systems to be able to adjust their operation to limitations which are imposed by environmental regulations unless they are designed to do so. Attempts to conform operation to these limitations will result in compromises which, taken on the whole, are more detrimental than they are beneficial to the environment. In developing regulations, environmental considerations must be subjected to the same standards and scrutiny which we require of all technologies. They must be supported by experimental data, not be conjecture, and their economic ramifications must be carefully considered. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08312

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

USE OF LINEAR PROGRAMING FOR ESTIMATING GEOHYDROLOGIC PARAMETERS OF GROUNDWATER BASINS,
General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
David Kleinecke.
Water Resources Research, Vol 7, No 2, p 367-374, Apr 1971. 8 p, 1 tab, 8 ref. OWRR Project C-1339 (No 1971) (3).

Descriptors: *Simulation analysis, *Linear programming, *Hydrogeology, *Parametric hydrology, *Aquifer characteristics, Groundwater basins, Storage coefficient, Water storage, Permeability, Systems analysis, Mathematical models, Data collections, Data processing, California, Computer programs.
Identifiers: *Simulation models.

Simulation models of groundwater basins require that values be given for geohydrologic parameters such as permeability and storage capacity. These parameters may be estimated and later adjusted by trial and error to improve the ability of the model to simulate some known portion of the water history, or this process might be reversed to deduce geohydrology directly from the historical record. This suggestion was tested against a basin studied earlier by the California State Department of Water Resources. The fitting criteria used gave rise to linear programing formulations which were solved from the basin data. About one-third of the basin parameters were evaluated, but further development is required. It is believed that historical records, although apparently overdetermining the system of equations, actually underdetermine the system because of redundancy effects. The approach appears to offer the best known method for estimating the effective aquifer depth.
W71-07704

OPTIMAL USE OF COUPLED LEAKY AQUIFERS,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 04B.
W71-07916

THE CHANCE A FLOOD WILL BE EXCEEDED IN A PERIOD OF YEARS,
Soil Conservation Service, Berkeley, Calif. Watershed Planning Party.
E. Morton Markowitz.
Water Resources Bulletin, Vol 7, No 1, p 40-53, Feb 1971. 14 p, 5 fig, 14 ref.

Descriptors: *Floods, *Probability, *Freque analysis, Distribution patterns, Statistical meth Time series analysis, Reviews.
Identifiers: *Binomial distribution, Recurrenc tervals.

Terms commonly used in work involving f frequency estimates are reviewed. Five graphs two tables are presented to facilitate the us statistical methods in solving problems me hydrology. Examples are used to illustrate terms, graphs and tables, and to familiarize hydrologist with the potential of the biomial tribution as a tool in flood forecasting. The tionship between the binomial distribution an normal distribution offers the most intuitive planation of the normal distribution available napp-USGS)
W71-08058

ELECTRIC ANALOG MODEL STUDY OF HYDROLOGY OF THE SAGINAW FOR TION IN THE LANSING, MICHIGAN AR 1963,
Michigan State Univ., Lansing. Dept. of Geolo
For primary bibliographic entry see Field 04B.
W71-08184

APPENDIXES TO THE USE OF SYST ANALYSIS IN THE DEVELOPMENT WATER RESOURCES MANAGEMENT PL FOR NEW YORK STATE,
New York State Department of Environm Conservation, Albany. Div. of Water Resourc
A. C. Tedrow, C. S. Liu, D. B. Halton, and R. Hiney.
Available from the National Technical Inform Service as PB-199 540, $3.00 in paper copy, in microfiche. Vol II, June 1970. 148 p, 7 plates. OWRR Project C-1126 (No 1586) (1)

Descriptors: *Systems analysis, *Water res development, *Water management (Ap *Decision making, *Analytical techniques, puter programs, Input-output analysis, Digita puters.
Identifiers: Transition function, Flow diagram

Six appendixes were presented as a supplem the study on the use of systems analysis development of water resources managemen for New York State. Appendix A showed t allocation problem of a multi-reservoir river involves three decisions: the storage operati diversion operation, and the release operat only two are independent. A dynamic gramming technique was applied to decomp two-decision for the river system manag model were described in Appendix B where was to provide methods which stored infor in an analytical form. The next appendix in the development of the river system tra function employed in the management m define and reduce the feasible ranges of the systems operations. Appendix D presente charts and program listings for the River Management Analysis and typical input and data from the Oswego River Basin operati dy. Appendix E was included to more fully the adaption of the Oswego Conservation M a high speed digital computer. Documenta the Flood Routing Model Program in App included description of the model program tions of the variable names used, generaliz diagrams, and computer program listings. (
W71-08185) (Kriss-Cornell)
W71-08186

COMPUTER PROGRAM FOR STATIS ANALYSIS OF ANNUAL FLOOD DATA LOG-PEARSON TYPE III METHOD,
Minnesota Univ., Minneapolis. St. Antho Hydraulic Lab.
C. Edward Bowers, Arthur F. Pabst, and Ste Larson.

lable from the National Technical Information ice as PB-199 541, $3.00 in paper copy, $0.95 icrofiche. Computer Program No 1, Jan 1971. 11 fig, 2 tab, 4 ref, 3 append.

riptors: *Computer programs, *Statistical ods, *Flow control, *Flood, Streams, Input-ut analysis, Data.
ifiers: *Log-Pearson type III distribution, rithms.

adoption of a uniform method of establishing flow frequencies by use of the log-Pearson III distribution by the Water Resources Coun-as discussed. The objective was to obtain con-t estimates of flood frequencies. The method first transforms the natural data to their ithms and then computes the statistical neters. The basic equations associated with g-Pearson Type III distribution were included ugh it is not necessary to go through the ss of solving these equations since the dimen-ss probability distribution was provided in form. With the table available the primary em was determinization of logarithms of the s and the mean, standard deviation, and ness of the logarithms. The computer program was written in Fortran IV language and was in-d in the appendix. The example used illus-d the input and output data for annual floods o Minnesota streams. The log-Pearson Type tribution appeared to have an advantage over distributions commonly used in flood ency analysis in that it could be used with data g skewness coefficients other than one. To il-te its use, it was applied to selected streams in nited States. (Kriss-Cornell)
08187

UMENTATION REPORT--FWQA DYNAM-STUARY MODEL,
onmental Protection Agency, Washington, Water Quality Office.
rimary bibliographic entry see Field 05G.
08189

DOM-WALK MODEL OF STREAM NET-K DEVELOPMENT,
Watson Research Center, Yorktown Heights,

rimary bibliographic entry see Field 07A.
08190

GN CONDUIT SYSTEM BY DYNAMIC GRAMMING,
ii Univ., Honolulu. Dept. of Agricultural En-ring.
rimary bibliographic entry see Field 08B.
08191

E EFFICIENT DYNAMIC PROGRAMMING ORITHMS FOR THE OPTIMAL SEQUENC-AND SCHEDULING OF WATER SUPPLY JECTS,
Western Reserve Univ., Cleveland, Ohio.
O. Esogbue, and Thomas L. Morin.
nical Memorandum No 192, Operations De-ent, School of Management, Case Western ve University, Contract DAHC 19-68-C-July 1970. 23 p, 3 fig, 2 tab, 3 ref, 2 append.

iptors: *Dynamic programming, *Optimiza-*Water supply, *Sequence, *Scheduling, Costs, Water demand, Project planning, Effi-ies.
fiers: Algorithms.

urpose of this paper was: (1) to show that the nic programming algorithm presented by er, Haimes and Hall for optimal sequencing ter supply projects, and referred to as DPI, be modified to solve a much more general of problems, the scheduling problem and (2) sent a more efficient dynamic programming thm, DP2, for solving both the sequencing and scheduling problem. The sequencing problem involved sequencing (timing) the construction completion dates of each of the N projects so that water demand will always be met and the sum of present costs of the N projects will be minimum. The scheduling problem considered was where N independent water supply projects were given and it was desired to select some subset of them to be constructed and then to sequence their completion times. A basic permutation schedule theorem was presented upon which DP2 was based and proof of the theorem was given in the appendix. The computational superiority of DP2 over DP1 for the sequencing problem was illustrated by solving a simple example posed by Butcher, Haimes and Hall. It was shown that the advantages of DP2 over DP1 increased size and complexity of a given problem. Efficient relevant algorithms capable of being utilized, with present day computational devices, to solve the problems encountered in water resources systems were produced. (Kriss-Cornell)
W71-08193

INTRODUCTION TO BAYESIAN METHODS USING THE THOMAS-FIERING MODEL,
Kansas City Univ., Manhattan.
W. J. Conover.
Supported by U. S. Geological Survey. Water Resources Research, Vol 7, No 2, p 406-409, Apr 1971. 4 p, 2 ref.

Descriptors: *Mathematical models, *Decision making, *Estimating, *Risks, *Correlation analysis, Investment, Computers, Dam design.
Identifiers: *Bayesian methods, *Thomas-Fiering model, Loss function.

A mathematical model was used to estimate unknown parameters of investment decisions in water resources. This Bayesian approach to estimation involved use of the estimator that minimized the expected risk, where risk was the expected loss. Bayes' estimators might be used in a wide variety of situations for which probabilistic models have been specified. In an example, a Bayes estimator of the serial correlation coefficient (p) in streamflow was shown to be a weighted average of the sample serial correlation coefficient (r) and the mean of all population serial correlation coefficients. The density of p was called the 'posterior density' when r was given, as opposed to the 'prior density' when r was not known. The posterior density was combined with the loss function to show that (1) if the loss function was the squared error loss function, the Bayes estimator was the mean of the posterior density; (2) if the loss function was the absolute deviation loss function, then the Bayes estimator was the median of the posterior density; and (3) if the loss function was almost constant then the Bayes estimator was the mode of the posterior density. Also, it was shown that the methods of Bayes' estimation do not lend themselves to numerical methods as performed on a computer. (Kriss-Cornell)
W71-08194

OPERATING RULES FOR JOINT OPERATION OF RAW WATER SOURCES,
Wisconsin Univ., Madison. Dept. of Civil Engineering; and Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 04A.
W71-08195

CHEBYSHEV OPTIMAL WASTE DISCHARGES,
Yale Univ., New Haven.
For primary bibliographic entry see Field 05G.
W71-08197

OPTIMUM DESIGN OF INTERBASIN TUNNEL SYSTEMS,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W71-08198

WATER AND AIR IN REGIONAL PLANNING (IN GERMAN).
Water Resource Association of Northwest Switzerland.

Schmassmann, Hansjorg (ed). Proceedings of the Third International Congress Pro Aqua, Basel Switzerland, 1965, Munich, R. Oldenbourg, 1967. 424 p, 166 fig.

Descriptors: *Water supply, Water pollution, Storage basin, Cost-benefit analysis, Regional analysis, Groundwater, Sewage disposal.
Identifiers: *Iso-economic point, Subsidy, Transportation cost.

This book contains the papers presented at the third International Congress PRO AQUA, 1965, in Basel, Switzerland, which dealt with problems of water and air in connection with regional planning. The larger part of the contributions concerns problems of water use and the planning of water supply. A major section considers questions of water quality, supply, and allocation as related to power plants. In a second section, large area and long-term planning of drinking and industrial water supply are discussed, in particular the topics include, groundwater protection, water supply, and regional and interregional water distribution. The remaining sections treat technical aspects of water use, waste water disposal and purification. (See also W71-08261 andW71-08262) (Siegenthaler-Rutgers)
W71-08260

THE ECONOMICS OF POLLUTION AND THE INTERDISCIPLINARY APPROACH TO ENVIRONMENTAL PLANNING,
Technische Hochschule, Darmstadt (West Germany).
Gerhard Kade.
International Social Science Journal, Vol XXII, No 4, p 563-575, 1970.

Descriptors: *Water pollution, Decision-making, Cost-benefit analysis, Resource allocation, Economic efficiency, Optimization.
Identifiers: *Environmental planning, Social cost, Externalities, Objective function.

Present methods of dealing with pollution and proposals of alternative strategy to environmental planning are considered. The author discusses traditional planning models and points out their inadequacies and implementation problems. The use of social costs and externalities in order to make an assessment of social loss attributable to air and water pollution is discussed. The author concludes the economist's use of taxes and subsidies as a solution to pollution is overly technological and neglects the social and political aspects of the problem. An interdisciplinary planning approach is presented to deal with environmental pollutants with the first step involving problem identification and the recognition of the interrelationship among pollutants. The second phase deals with the organization of the planning process and finally the solution to the problem and means of implementation are considered. This planning approach is designed to bridge the gap between program formulation and implementators through the continual involvements of environmental planners in all phases of analysis. (Siegenthaler-Rutgers)
W71-08264

APPLICATIONS OF MONTE-CARLO METHOD TO RESERVOIR DESIGN,
Institut fuer Wasserwirtschaft, Berlin (East Germany).
Siegfried Dyck, and Michael Schramm.
In: Proceedings of the International Hydrology Symposium, Sept 6-8, 1967, Colorado State University. Fort Collins, Colorado, Colorado State University Press, p 406-413, 1967.

Descriptors: *Monte Carlo method, Reservoir design, Correlation analysis, Gaging station, River flow, Regression analysis, Time series analysis.
Identifiers: *Autocorrelation, Residual mass.

The Monte Carlo method is applied to storage problems or reservoir design. The authors generate time series of discharge which satisfy the observed laws of river flow as a prerequisite to the application of the Monte Carlo method. The method used to generate the time series is that proposed by Svanidze and is a three stage process. First, a series of mean annual river flow is generated followed by a series of annual hydrographs. Combination of the two time series is made and correlation analysis then applied. The results of the correlation analysis are a series of generated monthly river flows which enter into the Monte Carlo calculation. Using the same method, it is also possible to generate parallel series of river flow for a network of rivers. (See also W71-08265) (Siegenthaler-Rutgers)
W71-08268

ON THE PROCESS OF BUDGETING: AN EMPIRICAL STUDY OF CONGRESSIONAL APPROPRIATION,
Carnegie Inst. of Tech., Pittsburgh, Pa.
Otto A. Davis, M. A. H. Dempster, and Aaron Wildavsky.
In: The Planning-Programming-Budgeting System: Progress and Potentials, Washington, The US Government Printing Office, p 263-322, 1967.

Descriptors: *Government, *Budgets, *Resource allocation, Statistics, Decisionmaking, Model studies, Time, Social aspects.
Identifiers: *Non-defense agencies, *Linear systems, Budget formation, Stochastic difference equations, Estimating procedures.

A study is presented of the processes through which government's apportion funds between alternative uses in allocating a significant portion of the country's resources. Simple laws are found, on the basis of statistical evidence, for the realized behavior of the process in at least half of the non-defense government agencies. For such agencies, certain linear systems of two stochastic difference equations are specified and fitted to time series data, with favorable results, suggesting that such systems accurately summarize certain aggregate outcomes of the budgeting process. Several models are presented, and their empirical results are analyzed in light of their limitations as alternatives in the decision making process. The criteria for determining a best specification for any agency from estimates of the alternative models is also considered. This article is valuable and relevant to the decision-making process involved in the budget formation for allocation of resources for water resource investment. (Murphy-Rutgers)
W71-08272

EVALUATION MODELS FOR REGIONAL DEVELOPMENT PLANNING,
Iowa State Univ., Ames; Manitoba Univ., Winnipeg; and Minnesota Univ., Minneapolis.
Jerald Barnard, James MacMillan, and Wilbur Maki.
The Regional Science Association Papers, Vol 23, p 117-138, 1969.

Descriptors: *Regional analysis, *Model studies, *Natural resource development, *Economic analysis, Measurement, Input-output analysis, Capital, Government, Technology, Costs, Income, Investments.
Identifiers: *Evolution models, *Social accounts, *Development program, *Economic growth, Interlake area, Market, Human resources.

This paper presents an evaluation model for measuring the impact of a regional development plan in the Interlake Area of the Province of Manitoba, the object being to determine if maximum benefits have been gained from the funds spent. The Interlake Area's problems concerned the adjustment of natural resources and human and social capital to changing market and technological conditions. A federal-provincial regional development program was to be evaluated for efficacy in local resource development, occupational adjustments, reduction of costs, and improvement in both the quality and range of choice in public and private services. The evaluation process involves a system of social accounts which includes both current and capital accounts for business and government and provides a basis for developing a dynamic model of the economy. A dynamic mathematical account is formulated which simulates the area's growth over time to serve as a basis for measuring and evaluating the development plan programs. The proposed model is designed to facilitate understanding of the impact of alternative programs, to promote regional development, and to develop a regional growth model. This model should be of interest to water research concerned with the analysis and evaluation of the effect of water resource investments on a regional economy. (Murphy-Rutgers)
W71-08277

THE SPECIFICATION OF REGIONAL ECONOMETRIC MODELS,
Pennsylvania Univ., Philadelphia.
Lawrence R. Klein.
The Regional Science Association Papers, Vol 23 p 105-115, 1969.

Descriptors: *Regional analysis, *Model studies, *Economic analysis, Income, Jobs, Rate of interest, Social aspects, Capital, Technology, Demand, Taxes, Prices.
Identifiers: *Econometrics, *Policy simulations, *Economic activity, Endogenous variables, Exogenous variables.

Econometric models generate regional variables of interest to state governments and businesses with limited market areas. The problem of industry models is presented as an analogous situation to the regional models in the discussion. The industry models selected are those of steel and automobiles. For each of these, the general structure of a plausible industry model is presented and endogenous and exogenous variables are delineated. It is then proposed that industries could be separately modeled in similar equation systems, which could then be linked consistently to a national aggregative model. Proposals for regional model building are similarly developed, and the static portions of the model relationships are specified in detail to support the concept of developing a particular model from a general one. Data requirements are discussed, and the drawbacks to the proposed method are juxtaposed with its advantages. This article is relevant to water research interested in analyzing the effects of water resource investment on a region as well as forecasting regional water demand. (Murphy-Rutgers)
W71-08278

APPLICABILITY AND LIMITATIONS IN THE USE OF NATIONAL INPUT-OUTPUT TABLES FOR REGIONAL STUDIES,
Cornell Univ., Ithaca, N.Y.
Stanislaw Czamanski.
Morgan Thomas (ed), The Regional Science Association Papers, Vol 23, p 65-77, 1969.

Descriptors: *Input-output analysis, *Regional analysis, *Model studies, Prices, Time, Demand, Economic analysis, Costs, Measurement, Data collection.
Identifiers: *Washington State, *Case study model, Field survey, Primary industries, Imports.

Research is presented that is designed to develop and test a regional model by adjusting national input-putput co-efficients that would eliminate all or part of the differences due to price changes over time, degree of fabrication, composition of demand, industry mix, and structure of imports. The research also aimed at determining which sectors could be handled by short-cut methods without destroying the forecasting value, and which sectors would require field study. The probable errors the case study model used were also analyzed, a compared with cost and time savings. The mo used was a Washington State table, and the res indicated that the methods yielded accepta results by considerably adjusting national inp output tables for purposes of regional studies. S methods excluded tertiary sectors through aggre tion and used field surveys to obtain input-out coefficients for primary industries and industrie which the regional economy is specialized. Th results are relevant to the economic analysis of gional water resources problems. (Murphy-R gers)
W71-08279

THE REGIONAL MUTIPLIER--SO PROBLEMS IN ESTIMATION,
Glasgow Univ. (Scotland).
K. J. Allen.
In: Regional and Urban Studies, Beverly Hills, S Publication, 1969, p 80-96.

Descriptors: *Regional analysis, *Forecast *Economic analysis, Statistics, Costs, Income, cial aspects, Taxes, Government.
Identifiers: Scotland, *Multipliers, Consump patterns, Employment, Savings, Purchases, gional leaks, Imports, Marginal propensities.

A discussion is presented of the meaning, uses, importance of the regional multiplier in regi economics and policy. The paper is relevan those areas of water resource analysis which mand a knowledge of the future of the regi economy in order to predict water demand. topics treated are national and regional multip the size of the multiplier, income and expend leaks, imports, and the use of marginal prop ties. As an illustration of the various concep value is given to the Scottish regional mult based on the assumption that all production are labor costs. This assumption permits the mation of the size of the mutiplier through an ysis of Scottish consumption patterns. The re are then criticized for accuracy of calculation comprehensiveness of analysis, and stress is to the importance of the regional multiplier analytical and forecasting tool in economic p making. (See also W71-08281) (Murphy-Rutg
W71-08283

REGIONAL INPUT-OUTPUT ANALYSIS,
Glasgow Univ. (Scotland).
Edith M. F. Thorne.
In: Regional and Urban Studies, Beverly Hills, Publications, 1969, p 97-120.

Descriptors: *Regional analysis, *Input-o analysis, *Planning, Statistics, Industrial pr tion, Economic analysis, Technology, Income mand, Social aspects.
Identifiers: Scotland, *Flow tables, Na product, Buyers, Growth, Sales, Coefficients pluses, Wealth.

An introduction is provided to the problem volved in the use of input-output analysis gional planning. A simplified account of inpu put analysis is described through use of inpu put tables together with an analysis for a hypo cal economy. Regional analysis is discussed this explanation as background information the regional aspect, a simple input-output m presented, indicating the application of re input-output analysis. The preparation of the output tables is discussed in some detail, as a uses and limitations of such tables in re economic planning. The benefits of the con tion of theoretical and statistical factors that from such analysis is indicated and the value resulting system of inter- and intra-regiona ages is cited. The article is appended with a p tation of a Scottish regional input-output p that serves to illustrate the key concepts of th This article provides a valuable general expla of regional planning analysis and may pro

able in the area of regional water resource elopment. (See also W71-08281) (Murphy-gers)
1-08284

LTISTAGE ALLOCATION OF RESOURCES IATURAL PLANNING,
York Univ., N.Y.; and Alabama Univ., Hunt-e.
. L. Narasimham, and Abbas Mirakhor.
neering Economists, Vol 16, No 2, p 103-116, Feb 1971.

criptors: *Resource allocation, *Planning, ximization, *Economic analysis, Decision ing, Input-output analysis, Optimization, In-ment, Capital, Economic efficiency.
tifiers: *National planning, *Dynamic pro-ming, *Maximum principle, *Economic lopment, Global optimality, Consumption, city.

ies were made of the difficulties of resource al-ion in a multistage, two-sector national ning model and how discrete versions of mic programming and maximum principle can pplied to this problem. This problem of ascer-ng the optimum allocation of scarce resources hieve stated goals is cited as the most crucial of the operational research of economic lopment and planning. This problem of rce allocation in national planning is nted as an essentially sequential decision ess, which has usually been dealt with by using r programming or input-output techniques. ever, in this paper the techniques of the dis-versions of dynamic programming and the mum principle are shown to be specifically ned for multistage decision processes, this ng them especially suitable for resource allo-n planning. The merits and shortcomings of techniques are shown, indicating that both ods are necessary to locate the global op-m in problems such as nationally planned r resource allocation. (Murphy-Rutgers)
-08297

Evaluation Process

OCATING WATER AMONG ALTERNA-E USES,
da Univ., Gainesville.
Reynolds.
nal of the Irrigation and Drainage Division, edings of the American Society of Civil En-rs, Vol 97, No IR1, p 85-92, Mar 1971.

criptors: *Allocation, *Economic efficiency, , Optimization, Water demand, Profit, Projec-

ifiers: *Alternative uses, *Economic criteria, t function, Marginal physical product, Mar-value product.

vant economic criteria for allocating water g alternative uses were examined in this r. The approach was to consider first the in-ing demands for water and then to examine omic criteria for allocating water and the in-ationships between economic, physical, and ational considerations in making allocation ions. To develop these economic criteria, as-that one of the goals of society is economic ency. Also assume that production functions e estimated for all outputs. The production ions for different outputs and producers were ssed in general mathematical terminology. was defined as the sum of the gross revenues l producers minus the sum of the production of all producers. Profit maximization was ed by the partial derivatives of the profit func-The economic criteria presented should in-e the nature of the data needed for allocating among alternative uses. (Wang-Rutgers)
07737

CONSUMER ASSESSMENT OF WATER QUALITY AND THE COST OF IMPROVEMENTS,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 05G.
W71-07738

ECONOMIC PLANNING FOR STAGED DEVELOPMENT,
Harza Engineering Co., Chicago, Ill. Resources Development Branch.
K. E. Sorensen, and R. D. Jackson.
Journal of the Hydraulic Division, Proceedings of American Society of Civil Engineers, Vol 94, No HY5, p 1231-1244, Sept 1968. 9 fig, 2 ref.

Descriptors: *Planning, *Costs, *Benefits, Investment, Projects, Water development, *Evaluation.
Identifiers: Staged development, Economic analysis, Criteria.

The engineering techniques and economic criteria for the planning and evaluation of staged development are discussed. The principal reasons for staged development are: evolving needs, limitations of investment capital, limitation of authorization, and limitations of basic data. Types of staged development include series of independent projects, series of interrelated projects, increment expansion of individual projects, planned obsolescence, and changes in project functions. Three principal economic factors which influence staged development are: (1) needs, goals, and benefit; (2) costs of water development; and (3) costs of non-water alternatives. The criteria that best suit analysis of staged development will relate to the rate of return on invested capital to the benefits achieved, or to the cost of alternative solutions. Two examples of economic analysis for staged development are given. It is a duty for the water resource planner to present a realistic evaluation of the economic merits of the water development and its alternations, as a guide to policy decisions. (Wang-Rutgers)
W71-07746

ECONOMIC EVALUATION: ALTERNATIVES FOR INDUSTRIAL TREATMENT,
Wichita State Univ., Kans.
For primary bibliographic entry see Field 05D.
W71-07752

WATER,
LTA Ltd., Johannesburg (South Africa).
Henry Oliver.
Optima, Vol 20, No 2, p 58-67, June 1970. 4 fig, 6 tab.

Descriptors: *Water resources planning, *Multiple-purpose projects, *Water allocation (Policy), *Semiarid climates, *Dams, Hydroelectric power, Economic efficiency, Water users, Water costs, Evaporation, Irrigation practices, Irrigation efficiency, Planning, Consumptive uses, Industrial water, Effluents, Water quality control, Economic feasibility, Water consumption (Excludes consumptive use), Rainfall, Water assimulative capacity.
Identifiers: *South Africa.

Historically, dams have been built for agricultural purposes, but modern pressures on water supplies are so intense and conflicting that the accent is currently on inter-regional development requiring multipurpose dams. South Africa is a thirsty, semiarid region with low, sporadic rainfall and consistently high evaporation. Groundwater is limited and unreliable, but still provides supplies for 65% of the country's land area. Dam storage results in extremely high evaporation losses. Of all water-consuming sectors of the economy, agriculture is by far the greatest user. Due to limited river resources, lacking economics of scale and the need for great storage capacities because of environmental aridity, irrigation water development costs are extremely high. Surprisingly, this is not reflected in user costs and there is no incentive to achieve efficiencies in use. It is suggested that yields relative to development costs and water losses make arid lands irrigation developments impractical and that more attention should be given to irrigation projects which would stabilize and increase production in humid regions. Consumptive use criteria in planning river basin development in dry regions are inadequate and more attention should be focused on water rehabilitation. South African industrial use is much greater than statistics indicate because of the consumptive effects of effluent discharge. This must be ameliorated by better recycling and effluent elimination practices. Water price structures for industries and municipalities are also too low and should be reexamined. Ultimately water costs may exceed both price and value if the status quo is blindly maintained. (Casey-Arizona)
W71-07807

HUMAN RESPONSE TO RECURRENT DROUGHT IN NORTHEASTERN BRAZIL,
Colorado Univ., Boulder.
R. H. Brooks.
Professional Geographer, Vol 23, No 1, p 40-44, Jan 1971. 2 fig, 18 ref.

Descriptors: *Droughts, *Social impact, *Political aspects, *Economic impact, History, Water storage, Rainfall, Migration, Crop response, Semiarid climates.
Identifiers: *Starvation, *Northeastern Brazil.

The heavily populated semiarid northeastern region of Brazil has 2 seasons, a rainy winter and a dry summer. The population is composed mainly of unskilled laborers and peasants living at poverty levels and sustained by a semimarginal agriculture which is dependent upon the winter rains. These rains are not dependable as evidenced by a record of 36 droughts lasting 1-5 years between 1603 to 1958. The social results are calamitous. An estimated 2 million people died as a result of drought factors from 1877 to 1919. As a drought progresses, food supplies diminish, cattle herds starve and food prices progressively increase. In extended famines the people have eaten any animals or plants available, cooked or raw. Human physiological deterioration has in turn led to unchecked epidemics. The major sociological consequence has been in 2 forms of migration: micromigration, mainly from rural areas to villages and urban areas, and macromigration, which is mass flight to other parts of Brazil. Governmental responses in the past have been mainly characterized by unpreparedness and lack of concern, although some belated forms of assistance did occur. The author feels that these recurrent calamities require a major governmental assistance program, and there are indications that such a program is finally being developed. (Casey-Arizona)
W71-07814

WATER RESOURCES AND IRRIGATION DEVELOPMENT IN THE MIDDLE EAST,
Keble Coll., Oxford (England). Dept. of Geography.
For primary bibliographic entry see Field 03F.
W71-07822

RETURNS FROM DRYLAND FARMING IN THE TRIANGLE,
Montana Agricultural Experiment Station, Bozeman. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 03F.
W71-07823

A PERSPECTIVE OF CONTEMPORARY WATER PLANNING AND MANAGEMENT PROBLEMS IN UTAH,
Utah Water Research Lab., Logan.
J. M. Bagley.
Originally presented at the 7th Annual Engineering Symposium, Brigham Young University, Apr 16,

1966. Occasional Paper 3, Aug 1969. 26 p, 5 fig, 1 tab.

Descriptors: *Utah, *Inter-basin transfers, *Semiarid climates, *Water resources development, *Planning, Social aspects, Legal aspects, Political aspects, Geographical regions, Economic feasibility, Runoff, Precipitation (Atmospheric), Consumptive uses, Water consumption, Phreatophytes, Evaporation, River basins, Water conservation, Colorado River Compact, Water management (Applied).
Identifiers: *Central Utah Project, Central Arizona Project.

Approximately 15% of the total annual rainfall of Utah, or 9 million acre-feet, becomes stream flow runoff. This amounts to 8,000 gallons per person per day, yet Utah is considered a chronically water-short state. Hydrologically, the state is divided into 3 basins, the Columbia (1% total runoff) the Great Basin (57%) and the Colorado (42%). The apparent water shortage arises from 2 phenomena: (1) over 2/3 of the water is consumed by phreatophytes and evaporation (2) about 57% of Utah's water yield comes from Great Basin drainage while about 85% of water consumption occurs there, and only 15% in the Colorado River Basin, indicating a maldistribution of resources. Of 1.9 million acre-feet available to the state in interstate waters, only 579,000 acre-feet are currently used, leaving the rest to flow downstream in the Colorado River, or into Great Salt Lake from the Bear River. Additionally, many circumstances indicate future reductions in Utah's share of Colorado River waters, while demand projections indicate greater future needs for Colorado River water than the state's present allocation. The Central Utah Project is in the planning stages, and will involve a transbasin transport from the Vintah mountains, for municipal consumption purposes, into the heavily populated Bonneville Basin. It is argued that this is unrealistic since it will involve millions of dollars spent in planning to import water into an area which, from a hydrologic viewpoint, already has a water surplus. Instead, an effort must be made to overcome the political power of the norther region and move water into southern underpopulated parts of the state. The development alternative of spreading rather than concentrating water makes much more economic sense. (Casey - Arizona)
W71-07825

RESOURCES, COSTS AND RETURNS ON CATTLE RANCHES IN THE MOUNTAIN AREAS OF COLORADO BY SIZE OF RANCH,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 03F.
W71-07829

INSTITUTIONAL DESIGN FOR WATER QUALITY MANAGEMENT: A CASE STUDY OF THE WISCONSIN RIVER, VOL I, SECTION A - SUMMARY,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05G.
W71-07972

WATER RESOURCES RESEARCH INVENTORY - 1969.
Department of National Development, Canberra (Australia).
For primary bibliographic entry see Field 09A.
W71-08093

A STORM DRAINAGE AND OPEN SPACE MASTER PLAN FOR HAMILTON COUNTY, OHIO.
Consoer, Townsend and Associates, Chicago, Ill.
For primary bibliographic entry see Field 04A.
W71-08122

WATER IN THE DESERTS,
Utah State Univ., Logan. Coll. of Engineering.
Dean F. Peterson.
Presented at an international conference 'Arid Lands in a Changing World,' Tucson, Arizona, June 1968. In: Arid Lands in Transition, Dregne, Harold E. (ed), p 15-30, Publication No 90, AAAS, 1970. 1 fig, 2 tab, 34 ref.

Descriptors: *Arid lands, Water resources development, *Social aspects, *Water users, Rainfall, Groundwater, River basins, Ecology, Deserts, Environmental effects, Groundwater recharge, Foreign countries, Ecosystems, Grazing, Food habits, Geographical regions, Irrigation practices, Irrigation effects, Irrigation systems, Salinity, Hydroelectric power, Navigation, Floods.
Identifiers: *Developing nations, *Technological effects, Ecological impact, *Oases, *Waterlogging.

In assessing the impact of man's exploding technology in dealing with desert water problems, desert water sources are briefly reviewed and methods of their utilization discussed. River types occurring in deserts ranged from low temporary to high perennial flows, in many areas, variously exploited by man for millennia. Groundwater is always an important water source of varying quality and such supplies may range from recently recharged reservoirs to the mining of fossil sources. Deserts are fragile ecosystems. Man's social structure is strongly influenced by his degree of adaptation, but this leads to the problem that the more he conquers his desert, the less the adaptation required but the greater the ensuing ecological disruption. In food gathering and hunting societies, which either directly or indirectly harvest the scant desert vegetation, social units are small wide-ranging ones having no major impact on desert ecology. Grazing societies, whether pastoral nomad or cowboy and sheepherder, also range over wide areas, but may wreak great ecological destruction through mismanaged overgrazing. Where scattered oases occur, an oasis agriculture may develop. This type of agriculture may be sustained by tapping groundwater supplies or by the creation of irrigation canals (such as Afghanistan's qanats). Modern technology has given rise to large-scale irrigation schemes involving local supplies or interbasin transfers. The problems arising from these schemes, particularly waterlogging and salinity, are discussed. It is maintained that alternatives must include adaptation as well as exploitation, including population control (Casey-Arizona)
W71-08134

AGRICULTURAL PRODUCTION IN IRRIGATED AREAS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 03F.
W71-08137

ECONOMICS OF LAND AND WATER USE,
New Mexico Univ., Albuquerque. Dept. of Economics.
Nathaniel Wollman.
Presented at an international Conference, 'Arid Lands in a Changing World', Tucson, Arizona, June 1969. In: Arid Lands In Transition, Dregne, H E (ed), Pub No 90, AAAS, p 143-163, 1970. 1 tab, 1 fig, 18 ref.

Descriptors: *Arid lands, *Economic feasibility, *Cost-benefit analyses, *Water utilization, *Competing uses, Economic prediction, Diversion, Efficiencies, Social aspects, Water policy, Water costs, Water users, Marginal productivity, Model studies, Land uses.
Identifiers: *Developing nations.

A formal economic model is developed, with simplified assumptions, for utilization of land-water resources, using alternative optimizing guides. Since overpopulation and illiteracy are contributing factors to poverty, it has been no means clear that aridity per se causes low per-capita incomes. A recent study of 39 countries indicated that no significant difference could be found between semiarid and arid countries with reference to eith gross domestic products or growth rates. This situ tion is emphasized by widespread water wastage both developed and undeveloped arid nation Many underdeveloped countries are unable to ef ciently utilize modern inputs into agricultu because of insufficient education, and irrigat land is therefore not a limiting factor. A relat problem, particularly in developed countries su as the U.S. and Israel, is the desirability of devoti water to agriculture when there is demand for it alternative uses such as manufacturing or minir After examining the costs of new water fro several possible sources, it is concluded, with rea vations, that when alternatives to agriculture a available they are usually preferable. Such proje as water diversion into the Colorado Basin f agriculture are considered economically u realistic. Education is considered, together w water resource development, as important facto in the growth of many arid lands. However, ev large development schemes, such as the Asw Dam, have small effects on per capita income heavily populated countries. (Casey-Arizona)
W71-08138

ROLE OF SOCIAL SCIENCE IN LAND A WATER UTILIZATION,
Massachusetts Univ., Amherst. Dept. Anthropology.
Richard B. Woodbury.
Presented at an international conference, 'A Lands in a Changind World', Arizona, June 19 In Arid Lands In: Transition, Dregne, H E (ed Pub No 90, AAAS, p 175-189, 1970. 30 ref.

Descriptors: *Social values, *Social impa *Political aspects, *Land use, *Water utilizati Arid lands, Planning, Decision making, Soc aspects, Evaluation, Economics, Behavior, Soc mobility, Social needs, Technology, Ecolo Semiarid climates, Geographical regions.
Identifiers: *Human ecology, *Cultu anthropology, *Social Sciences.

In planning problems involving technological novations, the social scientists have tradition deferred to engineers, thus diminishing their fluence in the planning of such practical matter water systems, and in the evaluation of hun ecological problems. Examples associated with Aswan High Dam and Lake Kariba are cited. vestigations in human and cultural ecology n consider historical successions of adap economics and the dislocations of various adap and behavioral modes wrought by technolog change. A cultural ecological study of farm pec in the semiarid plains of Saskatchewan yields so unsettling results for arid and semiarid region general. Perception is another critical area, only for planners and politicians handicapped limitations but also for those more immedia concerned. The example of widely varying per tions of drought by the plains farmers is ci Government agencies are prone to disagreemer matters involving evaluations based on per tions. The author maintains that we can no lo afford to develop arid regions on humid re criteria. New approaches must be develo through the cooperation of physical and so scientists. (Casey-Arizona)
W71-08150

INTERNATIONAL SYMPOSIUM ON C PUTER CONTROL OF NATURAL RESOUR AND PUBLIC SERVICES,
Office of Naval Research, London (England).
Immanuel Estermann.
Available from the National Technical Informa Service as AD-823 612, $3.00 in paper copy, $ in microfiche. ONRL Conference Report C-17 23 Oct 1967. 13 p.

Descriptors: *Water supply, *Power plants, *N ral resources, Oil industry, Control systems.
Identifiers: Israel, Data processing systems.

echnical program dealt with: water supply, oil eries, power stations, vehicular traffic, and hone systems. Selected papers are reviewed in l in this report. An appendix lists all papers itted.
-08166

SIBILITY STUDY OF WATER IMPOUND-TS, MESCALERO APACHE INDIAN ERVATION, SOUTH CENTRAL NEW MEX-

Engineering, Ventura, Calif.

able from the National Technical Information ce as COM 7100168, $3.00 in paper copy, in microfiche. Economic Development Ad-tration Technical Assistance Study, Dec 41 p.

iptors: *Reservoirs, Reservoir sites, Recrea-acilities, Economic impact, Damsites, New co, Tourism, Cost analysis.
fiers: Economic development, Skiing, Sites, g, Economic conditions, Feasibility, alero, Apache Indian Reservation, *Indian ations, Cienegita Creek, Campsites.

tudy describes six dam sites in terms of their le use to create water impoundment for tion. Three are recommended as best for im-te development in terms of reliability of supplies. Geological hydrologic findings are ted in text and charts. Benefits from tourist the facilities are forecast in terms of reser-o serve lodges in scenic and ski areas, camp-es, and use for stockwater and for fishing. reation capability of the water impoundment ts are part of the Mescalero Apache Tribe's ange plans for developing recreation for use on their reservation.
08172

RAL FRESNO COUNTY WATER AND D WASTE PROGRAM,
County Planning Dept., Calif.
imary bibliographic entry see Field 05G.
08176

RAL FRESNO COUNTY WATER AND D WASTE. VOLUME 1, SUMMARY SUP-ENT.
County Planning Dept., Calif.

ble from the National Technical Information e as PB-197 502, $3.00 in paper copy, $0.95 rofiche. Fresno County Planning Dept Re-Mar 1970. 115 p, 33 tab, 22 fig. HUD Grant.

ptors: *California.
iers: *Regional planning, *Water supply, Re-planning, *Waste disposal, Sewers, Public , Water quality, Groundwater, Project ng, Urban development, Economic factors, reclamation, Industrial wastes, Sewage treat-Mathematical models, *Fresno County .

ve volume publication proposes solutions to supply and liquid waste disposal in a 410 -mile area of Fresno County, California, en-ssing the cities of Clovis, Fowler, Fresno, urg, and Selma, plus intervening unincor-d portions of the County. The report recom-facilities required to satisfy projected needs short-range (1975), mid-range (1985), and nge (2015) periods. (See also W71-08179)
8178

RAL FRESNO COUNTY WATER AND D WASTE PROGRAM. VOLUME V. EMATICAL MODEL FOR GROUND-R.
County Planning Dept., Calif.

Available from the National Technical Information Service as PB-197 506, $3.00 in paper copy, $0.95 in microfiche. Fresno County Planning Dept Report, July 1970. 86 p, 6 tab, 45 fig, 14 ref. HUD Grant.

Descriptors: *California.
Identifiers: *Regional planning, *Water supply, Regional planning, *Waste disposal, Mathematical models, Sewers, Public health, Water quality, Groundwater, Project planning, Urban development, Economic factors, Water reclamation, Industrial wastes, Sewage treatment, *Fresno County (Calia).

The primary objective of the Water and Liquid Waste Program for the Central Fresno County Urbanizing Area has been to develop short-, medium-, and long-range programs for providing water supply and sewerage facilities from 1970 to 2015. A major emphasis of the study has been related to the protection of public health and the maintenance of groundwater quality and quantity in future years. (See also W71-08178)
W71-08179

LAND CONDITIONS AND NATURAL RESOURCES, EXISTING LAND USE, A. B. C. D. REGIONAL PLAN, PHASE I.
Mo-Kan Bi-State Planning Commission, St. Joseph.

Available from the National Technical Information Service as PB-196 836, $3.00 in paper copy, $0.95 in microfiche. Mo-Kan Bi-State Plan Report, Oct 1970. 112 p. HUD Project Missouri P-153.

Descriptors: *Land development, *Natural resources, *Planning, Land use, *Recreation facilities, Soil types, Environmental engineering, Vegetation, Climatology, Geology.
Identifiers: Regional planning, *Andrew County Missouri, *Buchanan County Missouri, *Clinton County Missouri, *DeKalb County Missouri.

The document contains a basic study of the Missouri-Kansas region, preparatory to the development of a future land use allocation plan. The study includes a review of the earth resources in the area; the historical climatical conditions; geology, topography and soils in the Region. In addition, water resources are inventoried on a general basis.
W71-08183

REGIONAL AND INTERREGIONAL PLANS FOR WATER DISTRIBUTION (IN FRENCH).
Bureau of Water Protection, Neuchatel (Switzerland).
A. Burger.
Proceedings of the Third International Congress Pro Aqua, Basel, Switzerland, 1965. Munich, R. Oldenbourg, p 224-244, 1967.

Descriptors: *Water supply, Regional planning, Water demand, Water pollution, Capital investment.
Identifiers: *Subsidy, Recycling, Interregional planning, Transportation cost.

The problem of water distribution at the regional and interregional levels are considered. Since natural water supplies in regional areas are generally insufficient, the regional water supply must be conveyed by artificial means to compensate for seasonal fluctuations. Interregional water supply systems require high transportation costs for the conveyance of water supply as well as investment in supply equipment. The result is that the price of water increases. The author suggests that subsidies from the state may be necessary to cover part of the investment, thereby avoiding excessive pay-off rates. Subsidies are especially relevant for rural areas where the financial yield of the water supply is low. The future indicates that increased scarcity and pollution will necessitate industrial recycling of water supply. (Siegenthaler-Rutgers)
W71-08262

EFFECT OF WATER RESOURCE INVESTMENT ON ECONOMIC GROWTH,
Economic Research Service, Upper Darby, Pa.; and Franklin Inst. Research Labs., Philadelphia, Pa.; and Temple Univ., Philadelphia, Pa.
P. Thomas P. Cox, C. Wilford Grover, and Bernard Siskin.
Water Resources Research, Vol 7, No 1, p 32-38, Feb 1971.

Descriptors: *Water resource development, Economic evaluation, Regression analysis, Hydrology.
Identifiers: *Economic growth, Discriminant analysis, Growth index, Socioeconomic indicator, Principal component analysis.

An analysis was made of the effect of water resource development projects on the economic growth of small regions. Counties in the Northeastern United States in which large water resource development projects were constructed between 1948 and 1958 were studied to determine whether the projects did stimulate economic growth. An index of growth composed of fifteen variables was used as a dependent variable and tested for its relationship with other independent variables using stepwise regression and discriminant analysis techniques. The results indicated there was no relationship between project size and economic growth and the selection of project sites was biased toward urban areas where there is a greater likelihood of economic growth. The authors conclude that it is dubious whether water resource projects serve as a stimulus to economic growth for the strictly rural counties tested for the northeastern United States. (Siegenthaler-Rutgers)
W71-08263

INTERNATIONAL HYDROLOGY SYMPOSIUM,
Colorado State Univ., Fort Collins.
Vujica Yevjevich.
Proceedings, The International Hydrology Symposium, Sept 6-8, 1967, Colorado State University. Fort Collins, Colorado State University Press, 1967. 671 p.

Descriptors: *Hydrology, Flood control, Probability, Water balance, Forecasting, Streamflow, Monte Carlo method.
Identifiers: *Skewness, Parametric statistics.

This book presents the papers delivered at the International Hydrology Symposium held at Colorado State University, September 6-8, 1967. One of the objectives of the symposium was to stimulate new scientific ideas and advance research methods in hydrology. The main subjects considered were new models for parametric, dynamic, physical or analytical hydrology and the application of statistical methods from the physical and social sciences to the study of hydrology. Models dealing with flood forecasting, reservoir design, and streamflow were also presented at the symposium. (See also W71-08266 thru W71-08268) (Siegenthaler-Rutgers)
W71-08265

A STOCHASTIC APPROACH TO THE DEVELOPMENT OF A REGULATION PLAN FOR THE GREAT LAKES,
Department of Energy, Mines and Resources, Ottawa (Ontario); and McGill Univ., Montrel (Quebec).
R. H. Clark, and G. S. Cavadias.
In: Proceedings of the International Hydrology Symposium, Sept 6-8, 1967, Colorado State University. Fort Collins, Colorado, Colorado State University Press, p 430-442, 1967.

Descriptors: *Regulation plan, Stochastic processes, Hydrology, Uncertainty, Decision-making, Water supply, Simulation analysis, Optimization, Probability distribution.
Identifiers: *Objective function, Autocorrelation, Clustering, Rule curve.

A stochastic approach to the regulation of the Great Lakes water levels and flows is presented. The hydrologic conditions of the Great Lakes have economic implications because competing uses including water supply, power development, and shore property interests. The regulation plan is considered as a sequence of decisions under uncertainty with the testing record generated by a stochastic process. The nature of this process is estimated from the historical record and the regulation plan is based on minimizing the probability of non-attainment of criteria developed from economic, technical, and social considerations. A multivariate model was used in the simulation analysis and the sequence generated were subjected to statistical tests such as clustering, frequencies, and autocorrelation to verify whether the properties of the recorded supplies were conserved. (See also W71-08265) (Siegenthaler-Rutgers)
W71-08267

ON THE APPROPRIATE DISCOUNT RATE FOR EVALUATION OF PUBLIC PROJECTS,
Princeton Univ., N.J.
William J. Baumol.
In: The Planning-Programming-Budgeting System: Progress and Potentials, Washington, U.S. Government Printing Office, p 152-159, 1967.

Descriptors: *Rate of discount, *Economic efficiency, *Resource allocation, *Government, Investment, Capital, Risk, Economic analysis, Cost-benefit analysis, Government supports, Welfare economics.
Identifiers: *Opportunity costs, Private alternatives, Yield, Irreplaceable resources.

Various ramifications of ascertaining an appropriate discount rate for the evaluation of public projects are discussed. The significance of the discount rate is dealt with, and opportunity cost is presented as the basic criterion for the choice of the discount rate based on an economic analysis of the uses of cost-benefit principles. The importance of the discount rate is stressed, since at stake is the allocation of resources between the private and public sectors of the economy. Several other factors are dealt with in some detail, including the opportunity cost of consumer resources, the discount rate on resources from the business sector, the changes in rates on government bonds, the calculation of the rate of return on long-term bonds, and the future subsidy issue. A discount rate of no lower than 4.75 percent is proposed by the author to avoid misallocation of resources and economic inefficiencies. This article is particularly relevant for the allocation and evaluation of water resource investment. (Murphy-Rutgers)
W71-08269

DISCOUNT/INTEREST RATES IN EVALUATION OF PUBLIC INVESTMENT PROJECTS,
Banks (R.L.) and Associates, Washington, D.C.
Robert L. Banks.
In: The Planning-Programming-Budgeting System: Progress and Potentials, Washington, U.S. Government Printing Office, p 237-242, 1967.

Descriptors: *Investment, *Cost, *Government, *Economic efficiency, *Interest rate, *Water resource development, Rate of discount, Cost benefit analysis, Taxes, Time, Resource allocation, Social aspects, Budgets, Planning, Profit.
Identifiers: *Opportunity cost, Cost effectiveness, Social cost, Programming.

The question is discussed of the appropriate discount rate to be used in assessing the economic feasibility of government investment, particularly water resource projects. The presentation includes a brief historical background, the critical role of discount/interest rates in benefit-cost calculation, and an evaluation of the appropriate interest/discount rate. The social goal of government projects is stressed, and it is indicated that usually this principal goal will be the achievement of optimal allocation of scarce resources, rather than other purposes which can be achieved only at the expense of economic efficiency. To avoid distortions in the benefit/cost calculations to achieve these goals, the author proposes utilizing the opportunity cost principle in calculating the appropriate interest/discount rate. The use of a lower rate is incompatible with political and social philosophy, as well as economically indefensible in government water resource investment. (Murphy-Rutgers)
W71-08270

PROGRAM BUDGETING IN WISCONSIN,
Wisconsin, Legislature's Joint Committee on Finance, Madison.
John W. Reynolds, and Walter G. Hollander.
In: The Planning-Programming-Budgeting System: Progress and Potentials, Washington, The US Government Printing Office, p 243-248, 1967.

Descriptors: *Decisionmaking, *Budgets, *Government, Costs, Economic efficiency, Planning, Economic analysis, Financing, Evaluation.
Identifiers: *Program budget, *Policy-making, Wisconsin, Review process, Program goals, Subprograms.

The revised program budgeting system in Wisconsin is presented as an example of the efficient operation of a system based on systematic techniques for planning, reviewing, modifying and carrying out government programs. Program budgeting is defined and developed along with the underlying considerations of the program and the key factors for success. The program budget format is broken down into sub-programs, which permit review for relative accomplishment. The expected results include budget preparation on the basis of expected results, upgrading of the budget decision-making process, and substantial improvement in the ease of public comprehension and appraisal of responsible government. This proposal for effective overhaul of the government budget process has relevance for government investment in public works projects, including those in water resources. (Murphy-Rutgers)
W71-08271

EXTRACTIVE RESOURCES AND TAXATION,
Wisconsin Univ., Madison.

Mason Gaffney (ed), Madison, University of Wisconsin Press, 1967. 450 p.

Descriptors: *Natural resources, *Taxes, *Government, *Optimization, Economic analysis, Risk, Fisheries, Natural resource development, Social aspects, Economic efficiency.
Identifiers: *Extractive resources, *Resource policy, Exhaustibility, Resource exploitation, Oil, Timber, Distribution.

This book presents the various proceedings of a symposium on extractive resources and taxation sponsored by the Committee on Taxation, Resources and Economic Development at the University of Wisconsin. Exhaustible resources and their taxation are treated as important links in the development of economic and fiscal theory and policy, the use of taxation being the assertion of public interest in the natural resources. The various articles included in the book appear in a manner designed to present all aspects of taxation of natural resources, and to advance proposals for such taxation under conditions of exhaustibility. The book divides the problem into overlapping areas of economic theory, economic institutions and economic policy which deal with such problems as resource depletion, resource exploitation, resource control, natural resource allocation, distribution and taxation. These topics are of special interest to research in water resource development. (See also W71-08274 thru W71-08275) (Murphy-Rutgers)
W71-08273

ECONOMIC THEORY AND RESOURCE POLICY,
Purdue Univ., Lafayette, Ind.
Irving Morrissett.
In: Extractive Resources and Taxation, Madison, The University of Wisconsin Press, p 295-31 1967.

Descriptors: *Natural resources, *Economic analysis, *Resource allocation, *Planning, Prices, Time, Government, Costs, Marginal cost, Taxes, Benefits, Social aspects, Income, Welfare economics.
Identifiers: *Public planning, Subsidies, Externalities, Cartelization, Market system, Competitive, Price theory.

A broad public policy for exhaustible resources presented in the setting of a policy for all natural resources. Particular attention is given to the role of controls, taxes, and subsidies in supplementing the price system. Price theory, competition theory and welfare theory are also utilized in the discussion. Several means are suggested to modify and supplement the operations of the imperfectly competitive market system of natural resources. Included in the remedies proposed are increased discussion and research on the social goals of the economy, taxation on the value of resource development of a technically feasible appropriate unit for natural resources, and better measurement of cartelization externalities of production. Further suggestions include avoidance of resource industries, use of long-run marginal cost as a basis for pricing all resources, use of justifiable subsidies for growth, and restriction of the time horizon for planning for public uses of natural resources. These points are relevant to all natural resources planning areas, including water resources. (See also W 08273) (Murphy-Rutgers)
W71-08274

OPTIMIZATION AND TAXATION IN OPEN-ACCESS RESOURCE: THE FISHERY,
Columbia Univ., New York. Graduate School of Business.
Giulio Pontecorvo.
In: Extractive Resources and Taxation, Madison, The University of Wisconsin Press, p 157-1 1967.

Descriptors: *Optimization, *Taxes, *Fisheries, *Government, *Resource allocation, Economic analysis, Population, Economic efficiency, Models studies, Price, Fish protein, Benefits, Income.
Identifiers: *Maximum physical yield, Market mechanism, Treaties, Constraints, Welfare, Inability, Valuation.

This article discusses the economic theory of fisheries, considering fisheries as a case where the market mechanism under normal (i.e. competitive) conditions fails to provide the proper allocation of resources. The problems associated with the accepted optimum of maximum physical yield are surveyed and the recent models integrating biological yield functions with economic conditions of production are presented. The various difficulties of these models are also discussed, particularly in light of their effect on fishing treaties. Recent theoretical developments of the fishing optimization problems are presented, with particular attention being given to the structural issues of instability and valuation. The conditions under which a developed fishery will provide a positive net economic yield are delineated and various taxation difficulties are discussed in relation to these conditions. Alternative means of taxation and valuation to reach the optimal goal are suggested in addition to methods of selecting the best means for a particular fishery. (See also W71-08273) (Murphy-Rutgers)
W71-08275

PROFESSIONAL DECISION-MAKING,
Rand Corp., Santa Monica, Calif.
James R. Miller.
New York, Praeger, 1970. 305 p.

riptors: *Decision-making, Operations rch, Systems analysis, Optimization, Risk, omic evaluation, Resource constraint, Cost.
ifiers: *Worth assessment, Sensitivity analysis, vorth, Cardinal utility, Capital budgeting.

book considers the subjective part of decision-ng, worth assessment, and decision-making sses. Worth assessment is outlined as a syste-ed procedure rather than subjective process gh the use of the concept of an assessment ure. Operations research, decision-theory, ystems analysis is used to derive the assess-structure. An experiment was performed to te the assessment procedure and to deter-whether professional decision-makers were to achieve successful implementation. The dure was empirically validated. The resulting assessment is integrated with resource con-ts to arrive at a final decision using a decision hat chooses the most feasible alternative with ghest worth score. The decision procedure is ded via sensitivity analysis to generate com-l alternatives or include uncertainty. This is relevant to water research concerned with on making processes. (Siegenthaler-Rutgers)
08276

ONAL AND URBAN STUDIES,
ngham Univ. (England); and Glasgow Univ. and).
Cullingworth, and S. C. Orr.
ly Hills, Sage Publications, 1969. 282 p.

iptors: *Regional analysis, *Planning, *Natu-source development, Cost-benefit analysis, ation, Transportation, Economic analysis, aspects, Jobs, Decisionmaking, Input-output is, Data collection.
fiers: *Resource use, *Social scientists, omic development, Inter-disciplinary ap-h, Regional multiplier, Economic potential.

ook is a selection of articles representing the ipation of social scientists in regional and studies. Issues discussed include regional mic planning and its limitations, the ques and complexities of labor market analy-d the problems involved in estimating the re-multiplier. Other concepts dealt with include ation projection, housing analysis, economics an transport and employment projections. , a case study of comprehensive urban al and industrial relocation in Glasgow is ted to indicate the interdependency of mic factors and planning decisions which has tressed throughout the various articles in the e. Practically all articles express dissatisfac-ith techniques in use, and propose changes areas for further study. Since the book ents a study of how to make the best use of al resources, thus achieving the desired goal nomic growth in regional development pro-it should be of interest to water research ting impact of regional water projects. (See 71-08282 thru W71-08285) (Murphy-Rut-

08281

ICIPATION OF SOCIAL SCIENTISTS IN NING--A BACKGROUND TO THE STU-

gham Univ. (England); and Glasgow Univ. nd).
ullingworth, and S. C. Orr.
gional and Urban Studies, Beverly Hills, Sage ations, 1969, p 1-19.

ptors: *Planning, *Economic analysis, *Cost analysis, *Regional analysis, Government, tion, Transportation, Costs, Social aspects, interest, Jobs, Uncertainities, Spillover.
iers: *Economic growth, *Economic pment, *Social scientists, Fiscal policy, Ex-ics.

ral survey is presented of social science ap-cs to planning problems in British regional and urban studies. A brief historical development of social scientists' participation in such planning is presented and contrasted with recent planning and planning thought, which is arbitrarily assumed to be post-1960. Particular attention is given to the dissatisfaction of pre-1960 planning and the need for the development of economic planning to deal with specific difficulties, such as those caused by population overspill, and innovative transportation techniques. Special attention is given to the relationship between the goal of growth and the development of under-utilized resources through public expenditure. The change in scope from urban to regional boundaries is also discussed in some detail. This article is relevant to research interested in the relationship of water resource development to regional economic growth. (See also W71-08281) (Murphy-Rutgers)
W71-08282

SANITARY SEWER COLLECTION SYSTEMS,
Department of Housing and Urban Development, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-08286

CAPITAL BUDGETING, A QUANTITATIVE EVALUATION OF INVESTMENT ALTERNATIVES,
Stanford Univ., Calif.
Robert V. Oakford.
New York, The Ronald Press, 1970. 276 p.

Descriptors: *Economic evaluation, Decision-making, Probability theory, Cost-benefit analysis, Risk, Budget constraint, Random variable.
Identifiers: *Capital budgeting, Sensitivity analysis, Present worth, Cash flow.

This book presents a discussion of capital budgeting, emphasizing the quantitative measures used in evaluating investment alternatives. The author defines the classical measures of worth: present worth, cost-benefit ratio, growth rate and cash flow and then discusses their relative strengths and weaknesses. Problem situations where decision-making occurs under conditions of uncertainty are considered along with the analysis of the criteria to be used in project evaluation. Sensitivity analysis is used to deal with uncertainty. Another approach used is the expression of uncertainty in terms of random variables, a method based on probability theory. Benefits and costs of prospective projects also are expressed as random variables for the decision-making process. This book is relevant to water research involved in capital budgeting decisions and project evaluation and selection. (Siegenthaler-Rutgers)
W71-08289

WATER, EARTH, AND MAN.
Cambridge Univ. (England).

Richard J. Chorley, ed. London, Methuen and Co., Ltd., 1969. 588 p.

Descriptors: *Hydrology, *Resource allocation, Cost-benefit analysis, Budget constraint, Systems analysis, Evapotranspiration, Surface runoff, Groundwater, Flood control.
Identifiers: *Water resource systems, Objective function, Opportunity cost, Capital cost.

This book presents a series of essays concerned with the theme that the study of water provides a logical link between an understanding of physical and social environments. Each chapter develops this theme by proceeding from the many aspects of water occurrence to a deeper understanding of natural environments and their fusion with the activities of man in society. Water is viewed not only as a commodity used by man but also as the mainspring for economic development and also a formative factor in the physical and biological environment as well. There is a description of techniques and new methods of analysis as applied to the water-resource field by social and physical scientists. (See also W71-08291 thru W71-08293) (Siegenthaler-Rutgers)
W71-08290

THE ECONOMIC AND SOCIAL IMPLICATIONS OF SNOW AND ICE,
Southern Illinois Univ., Carbondale.
J. Rooney.
In: Water, Earth, and Man, London, Methuen and Co., p 389-401, 1969.

Descriptors: *Economic evaluation, Water supply, Recreation streamflow, Cost-benefit analysis, Correlation, Decision-making.
Identifiers: *Snow zone management, Snow costs, Utility function.

Estimates are considered of the contribution of snow to agriculture, recreation, and domestic and industrial water supply. The cost of snow-caused disruption and loss of life are evaluated as well. The economic impact of snow-zone water on California and the Western United States agriculture is found to be significant both because of the value of snow as a water-supply source and its dependability in yield. The economic importance of snow-based recreation activity is discussed along with projections of increases in demand. The author finds the most detrimental economic effect of snowfall to be the disruption of communications and allied services. Data on snow disruption is categorized by urban area and impact on various activities. The author suggests the need for systematized decision-making to reduce snows cost of disruption. (See also W71-08290) (Siegenthaler-Rutgers)
W71-08291

HUMAN RESPONSE TO FLOODS,
Victoria Univ. (British Columbia).
W. R. Derrick Sewell.
In: Water, Earth, and Man, London, Methuen and Co, Ltd, p 431-451, 1969.

Descriptors: *Flood control, *Flood plain insurance, Risk, Flood plain zoning, Economic efficiency, Floodproofing, Cost-benefit analysis.
Identifiers: *Subsidy, Natural tax.

The changing patterns of responses to floods are examined. The author groups the possible adjustments to floods into the following categories: loss acceptance, public relief, emergency action, structural change, flood proofing, land use regulation, flood insurance, and flood control. However, only a few of these possibilities are considered in flood-management decision-making with the result that adjustment is much less efficient than if the full range is consulted. The Lower Fraser Valley in British Columbia is used as a case study of responses to a major flood problem. The author finds first that the adjustment to floods in this region is corrective but no preventive and secondly, there has been an increase in the share of costs of flood protection borne by the national government. The author concludes the Fraser River experience suggests that concentration on a narrow range of alternatives may lead to inefficient adjustment, and furthermore, flood losses covered by public subsidy induce firms or activities to locate in areas of substantial flood hazards. To alleviate these problems, a system of flood plain zoning, flood proofing and flood insurance is advised. (See also W71-08290) (Siegenthaler-Rutgers)
W71-08292

CHOICE IN WATER USE,
Simon Fraser Univ., Burnaby (British Columbia); and London Univ. (England).
T. O'Riordan, and Rosemary J. More.
In: Water, Earth, and Man, London, Methuen and Co., Ltd, p 547-573, 1969.

Descriptors: *Resource allocation, *Pollution abatement, Water supply, Recreation, Water resource management, Flood, Protection, Cost-benefit analysis, Systems analysis, Risk.

Identifiers: *Externalities, *Opportunity cost, Objective function, Time horizon, Capital cost.

Various techniques used in water resource management are considered for allocating water for multipurpose use and for integrated river-basin development. The purpose of allocation techniques is to discover for any given project the maximum net benefits and to weigh the relative merits of alternative projects. The evaluation process for a multipurpose water-resources system is complicated by problems of collective benefits, externalities, intangibles, uncertainty and opportunity cost. The two approaches to water resource allocation discussed are cost-benefit analysis and systems analysis. The advantages and disadvantages of each method are evaluated. These allocation techniques provide a range of possible choices with the actual decision resting in the political institutional process. Decision-makers are faced with physical, fiscal, and legal constraints. Examples are given to illustrate various institutional approaches to water-resource-allocation decision-making. (See also W71-08290) (Siegenthaler-Rutgers)
W71-08293

CAPITAL BUDGETING: A MODIFIED APPROACH TO CAPITAL ALLOCATION,
Oregon University, Eugene, Oregon; and Sacramento State College, Sacramento, California.
Leslie P. Anderson, and Vergil V. Miller.
Management Accounting Vol 50, p 28-32, March 1969.

Descriptors: *Decision-making, *Economic evaluation, Risk, Resource allocation, Interest rate, Discount rate.
Identifiers: *Capital budgeting, *Cumulative present value, Opportunity cost, Payback, Present value, Cash flow.

A modification is considered for the present value approach to investment decision making that enables the decision maker to visualize the impact of each variable on the decision making process. The suggested approach is cumulative present value which provides all the benefits associated with the use of the payback criterion as well as those of the more theoretically correct methods of project evaluation such as present value. Cumulative present value shows payback in discounted dollars and compares the discounted income streams of alternative proposals with equal present values. Examples are given that apply the cumulative present value method to investment proposals of varying life expectancies and time periods. This article is relevant for water research concerned with the evaluation of project proposals. (Siegenthaler-Rutgers)
W71-08295

REGIONAL INFORMATION DESIGN FOR PUBLIC DECISIONS,
California Univ., Los Angeles.
Werner Z. Hirsch.
Review of Income and Wealth, Series 15, No 4, p 369-380, Dec 1969.

Descriptors: *Decision-making, Regional analysis, Input-output analysis, Cost-benefit analysis, Resource allocation.
Identifiers: *Horizon scanning, Opportunity cost, Equity.

The use of regional information systems are considered as a tool toward improving the quality of policy decisions at the regional level. There are three components of regional information systems: policy-oriented information design, data banks, and analytic models. The information system presented in this paper is based on decision rules that relate to a horizon scanning decision process for uncovering future problems and opportunities. An example is given of the regional information system that classifies the environmental and program information and depicts alternatives futures and potential areas of concern for regional decision-making. This article is relevant to water research concerned with predicting regional water problems and contribution to the evaluation and solution of these problems. (Siegenthaler-Rutgers)
W71-08296

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMIC EVALUATION OF WATER SUPPLY PRICING IN ILLINOIS,
Illinois Univ., Urbana.
Hamdy H. H. Afifi.
Journal American Water Works Association, Vol 61, No 1, p 41-48, Jan 1969. 5 fig, 2 tab.

Descriptors: *Evaluation, *Marginal costs, Water rates, *Costs, Water demand, Elasticity, Analysis.
Identifiers: *Water supply pricing, Community growth, Block rate, Flat rate.

This study analyzed rate-making policies in Illinois and suggested a two-part seasonal rate structure to reflect the economic factors involved. The block rate was commonly used in Illinois, and it was reported in 84.5 per cent of the water rate schedules. The factors affecting water supply prices in Illinois were exposed to a regression model to determine the degree and significance of their relationship to actual charges. The cross-section data on the economic characteristics of the water utilities, the water rate charges, and the economic activities were incorporated into the analysis. The water supply's expected future demand in 1975 was analyzed in terms of different customer class demands, as well as overall water utility demand. The analysis revealed that population served is the primary basis for the expected growth. The economic evaluation of current water rates is concluded with a proposed water rate schedule that can give maximum effect to marginal cost pricing principles as well as the industry's financial requirements. Other study recommendations were discussed. (See also W70-02391) (Wang-Rutgers)
W71-07736

COST AND MANPOWER FOR MUNICIPAL WASTE WATER TREATMENT PLANT OPERATION AND MAINTENANCE,
Federal Water Quality Administration, Washington, D.C. Construction Grants and Engineering Branch.
For primary bibliographic entry see Field 05D.
W71-07743

HANDLING REVENUE AND COST ELEMENTS IN RATE SETTING,
Coffin and Richardson, Inc., Boston, Mass.
J. C. Adams, Jr., and V. F. Pennacchio.
Journal, American Water Works Association, Vol 62, p 754-764, Dec 1970. 6 tab.

Descriptors: *Rates, *Revenues, Allocation, *Costs, Program, Operation and maintenance.
Identifiers: *Comparative statement, *Pro Forma Revenues, Quasi-municipal.

The authors graphically present the mechanism of rate-making, with emphasis on the importance of the plant superintendent to the other professionals - the engineers, financial men, and accountants who specialize in the utility field, especially water - in setting rates that will yield required income. For a regulated public water utility, typical rate case exhibits are: (1) general map of the system, (2) proposed capital improvement program, (3) proposed financing program, (4) present rate schedules and charges, (5) proposed rate schedules and charges, (6) comparative balance sheet for last three years, (7) comparative statements of original cost of water operating property by primary accounts for last three years, (8) comparative income statement for last three years, (9) comparative statements of operating revenues by customer classification for last three years, (10) comparative statements of operation and maintenance expenses for last three years, (11) actual and pro-forma operation and maintenance expenses, (12) actual and pro-forma income statements, (13) allocation of pro-forma operating revenue requirement general service and to fire protection services, (1 summary of pro-forma revenues at proposed rat Examples were shown for exhibit (11) and (1 (Wang-Rutgers)
W71-07747

SURFACE SUPPLY COSTS MORE, FARM H REAU SHOWS,
Farmers Home Administration, Champaign, Ill.
D. H. Stoltenberg.
Water and Wastes Engineering, Vol 8, No 2, p 32, Feb 1971. 3 tab.

Descriptors: *Costs, *Operation and maintenan Rural areas, Economics, Water supply.
Identifiers: FHA, Surface supply.

The average operation and maintenance cost water systems for communities smaller than 1 population are discussed. The Farmers Home ministration (FHA) of Illinois has obtained sc results by collecting and analyzing statewide d for both FHA and non-FHA financed water syst including well supply, surface supply, and syst that purchase treated water from another com nity. Tabulated data included average opera and maintenance costs for both FHA and non-F financed water system, and breakdown of op tion and maintenance costs for FHA finan water system. It concluded that purchased w and well supply rank next to surface supply average monthly operation and maintenance c in rural areas, and the average operation and m tenance cost was less per user for the non-F systems than for the FHA systems. (Wang-Rutg
W71-07751

THE CARACAS WATER UTILITY: OVER APPRAISAL,
National Inst. of Sanitary Works (Venezuela); Ministry of Public Works, Caracas (Venezuela
P. P. Azpurua, C. Martinez, and P. M. Ruiz.
Journal American Water Works Association, 63, p 72-78, Feb 1971. 7 tab, 3 fig.

Descriptors: *Costs, *Returns, Consump Rates, Investments, Water demand, Analysis, ganizations.
Identifiers: *Water utility, *Overall appraisal cial benefits, Sanitary policy, Fair price, Tu Rate structure.

The findings of a 3-year study of the Caracas W Utility in Venezuela are summarized. Include findings regarding financial costs and return cial benefits, and a look at the future. Tabu data included water consumption by ho groups, population projection for Caracas, consumption in Caracas, assumed water de for Caracas-1981, water control in manage rating and water increases as a cost increme factor, assumed fair and actual price of the based on cost alternatives of Tuy 2, and ra family income to payment for water service conclusion from this analysis is that, if power remain at their present level ($0.0066 kwhr wages are not increased more than 5 per c year, the utility can operate on an average pr $0.188/264 gal, during the next three years, would then be reduced to $0.166/264 gal, pro the administration is improved substan (Wang-Rutgers)
W71-07753

CATCHBASINS CLEANED FOR $3.00.
For primary bibliographic entry see Field 05C
W71-07856

$37 BILLION: NEW PRICE TAG FOR CL WATER POLLUTION CONTROL COSTS.
For primary bibliographic entry see Field 05C
W71-07867

T OF DOMESTIC WELLS AND WATER
ATMENT IN ILLINOIS,
s State Water Survey, Urbana.
rimary bibliographic entry see Field 04B.
08129

OF MUNICIPAL SEWAGE TREATMENT
TS IN ILLINOIS,
s State Water Survey, Urbana.
rimary bibliographic entry see Field 05D.
08130

D CONTROL RELEASE OPTIMIZATION
G METHODS FROM CALCULUS,
ado Univ., Denver.
imary bibliographic entry see Field 04A.
08192

ICATION OF USER CHARGES TO
ER QUALITY MANAGEMENT,
go Univ., Ill. Graduate School of Business.
imary bibliographic entry see Field 05G.
08196

RAL MULTISTAGE MARGINAL COST
MIC PROGRAMMING MODEL FOR THE
MIZATION OF A CLASS OF INVEST-
-PRICING DECISIONS,
ll Univ., Ithaca, N.Y. Dept. of City and Re-
Planning.
ney Riordan.
Resources Research, Vol 7, No 2, p 245-
pr 1971. 10 p, 4 fig, 6 ref.

ptors: *Optimization, *Dynamic pro-
ning, *Marginal costs, *Investment, *Pricing,
matical models, Benefits, Demand,
ology, Economic efficiency.

eral method was developed for finding an op-
solution to the dynamic investment-pricing
m of a publicly owned or regulated
polistic enterprise with a technology of
ction exhibiting economies of scale given a
t demand for the output of the enterprise
sensitive to price. Four major components of
cision problem were also provided: policy,
d, technology and costs of production, and
conditions. Each of the first three com-
ts was subject to the important dimension of
ainty. Specific assumptions that determined
odel were recorded and fell neatly into the
stablished categories. For the formal con-
on of the model, the total instantaneous net
t of the operating system was equal to the dif-
e between the area under the demand curve
ie area under the short-run marginal cost
and were expressed algebraically. A discrete
ic programming algorithm was used to max-
economic efficiency for the investment-pric-
oblem. The major significance of the model
hat it combines the theory of welfare
mics and dynamic programming technique to
he joint investment-pricing problem under a
structural and procedural assumptions.
Cornell)
08204

UENT CHARGES: WATER POLLUTION
ROL,
mary bibliographic entry see Field 06E.
08231

AGE BASINS FOR WATER SUPPLY,
heshire Water Board (England).
n Davies.
edings of the Third International Congress
qua, Basel, Switzerland, 1965. Munich. R.
nourg, 1967, p 209-223.

ptors: *Water supply, *Storage basin, Water
ce planning, Reservoir storage, Flood con-
ntrol, Cost-benefit analysis, Forecasting.
iers: *Iso-economic point, Pumped storage

This paper considers some complex and interdependent factors that affect long range planning of a safe and adequate water supply. The author considers four types of storage basins to satisfy future water supply: reservoir basin, pumped storage basin, artificial basin, and a river control scheme. The economic and geographic merits of each scheme are considered in a cost-benefit framework. The storage basin should be planned and completed so that the iso-economic point (where water consumption and drought exceed water supply) is not reached. However, forecasts of water consumption should not neglect water costs arising from scarcity and pollution. The author finds that only through integrated planning of new storage basins for water supply, flood control and other societal needs, can the maximum benefits be achieved. (See also W71-08260) (Siegenthaler-Rutgers)
W71-08261

EXTRACTIVE RESOURCES AND TAXATION,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 06B.
W71-08273

CAPITAL BUDGETING, A QUANTITATIVE EVALUATION OF INVESTMENT ALTERNATIVES,
Stanford Univ., Calif.
For primary bibliographic entry see Field 06B.
W71-08289

UNIQUENESS OF THE INTERNAL RATE OF RETURN WITH VARIABLE LIFE OF INVESTMENT,
Stanford Univ., Calif.
Kenneth J. Arrow, and David Levhari.
The Economic Journal, Vol LXXXIX, No 315, p 560-566, Sep 1969.

Descriptors: *Economic evaluation, Capital investment, Interest rate, Discount rate, Project planning.
Identifiers: *Internal rate of return, Present value, Truncation period.

The use and limitations are considered for the internal rate of return as a selection criterion among investment projects. Previous work has indicated that an investment can have multiple internal rates of return if some of the net yields are negative. Maximization of present value with given rates of discount is then recommended as an alternative guide to project selection. The authors show that if there is a constant discount rate and a choice of the truncation period for the project that maximizes present value, then the internal rate of return for the truncated project will be unique. In addition, the authors find that if the life of the project is optimally chosen, then the maximized present value of the project is a monotonic decreasing function of the rate of interest. This article is relevant to water research concerned with decision-making and project selection. (Siegenthaler-Rutgers)
W71-08294

CAPITAL BUDGETING: A MODIFIED APPROACH TO CAPITAL ALLOCATION,
Oregon University, Eugene, Oregon; and Sacramento State College, Sacramento, California.
For primary bibliographic entry see Field 06B.
W71-08295

6D. Water Demand

ALLOCATING WATER AMONG ALTERNATIVE USES,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 06B.
W71-07737

HIGH PLAINS IRRIGATION AND TEXAS WATER PLAN,
Texas Technological Coll., Lubbock.
D. M. Wells.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 97, No IR1, p 123-130, Mar 1971. 4 tab, 7 ref.

Descriptors: *Irrigation, *Benefits, Value, Costs, Projections, Economics, Pumping.
Identifiers: *High Plains, *Secondary benefits, *Tertiary benefits, Farm income, Agriculture, Farmers.

The economy of the High Plains of West Texas is strongly dependent upon irrigated agriculture. Without the Texas Water Plan, or some similar plan for the importation of water to the High Plains, irrigated agriculture in the High Plains will shortly start a decline that will end in oblivion in less than a century. Of far greater significance will be the decline of secondary and tertiary benefits to other sectors of the economy. Secondary and tertiary benefits associated with irrigation had been estimated to range from about four times the primary benefits in a dry year to about seven times the primary benefits in a reasonably wet year. Current status of irrigation in High Plains, value of irrigation to the High Plains economy, and present cost of irrigation water in High Plains were discussed. It concluded that water should be imported to the High Plains to sustain and enhance the present level of irrigated agriculture in the area. (Wang-Rutgers)
W71-07740

ALTERNATIVE USES OF ARID REGIONS,
Ministere du Developpment Industriel et Scientifique, Paris (France). Direction du Gaz et de l'Electricite.
Georges Drouhin.
Presented at an international conference, 'Arid Lands In a Changing World,' Tucson, Arizona, June 1969. In: Arid Lands In Transition, Dregne, H E (ed), Pub No 90, AAAS, p 105-120, 1970. 7 fig.

Descriptors: *Agriculture, Water resources development, *Arid lands, *Tourism, *Mining, Sedimentary basins (Geological), Groundwater, Semiarid climates, Social aspects, Soil types.
Identifiers: *Sahara Desert, *Oases, *Fossil soils.

Semiarid and arid lands are generally faced with 3 critical problems: water scarcity, prohibitively expensive power costs, and saline water and soils. Semiarid areas are generally not inhospitable since they usually have some reliable water sources and support extensive agriculture. They are generally amenable to economic development and some sedentary settlement. Arid lands (deserts) are extremely variable, geologically and geographically. Most discussions are confined to the Sahara Desert. The author feels agriculture, mining, and tourism are important areas of potential desert development. The extensive sedimentary basins indicate large aquifers and many artesian zones. Groundwater depletion will probably not be a major problem in the near future. Oasis agriculture should probably concentrate on date palms. The presence of fossil soils indicates a wider distribution of cultivatable soils than formerly thought. In most, but not all areas, water resources are probably adequate to support mining operations. (Casey-Arizona)
W71-08135

SOME EFFICIENT DYNAMIC PROGRAMMING ALGORITHMS FOR THE OPTIMAL SEQUENCING AND SCHEDULING OF WATER SUPPLY PROJECTS,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 06A.
W71-08193

REGIONAL AND INTERREGIONAL PLANS FOR WATER DISTRIBUTION (IN FRENCH).
Bureau of Water Protection, Neuchatel (Switzerland).
For primary bibliographic entry see Field 06B.
W71-08262

AN INTERREGIONAL DEMAND-SUPPLY MODEL FOR WATER RESOURCE DEVELOPMENT,
New Mexico Univ., Albuquerque.
Nathaniel Wallman.
Morgan D. Thomas (ed), The Regional Science Association Papers, Vol 19, p 111-122, 1967.

Descriptors: *Water demand, *Water supply, Water resource development, *Model studies, *Irrigation, *Marginal cost, Agriculture, Surface runoff, Rivers, Population, Watersheds, Fish, Recreation, Effluents, Waste treatment.
Identifiers: *Chile, *Marginal cost constraint, Hydrologic definition.

A demand-supply model based an a study of Chilean water resources is presented. However, the method can be applied in other countries as well. The characteristics of the various water resources are presented, and their distribution and uses are discussed. The construction of the interregional water resource model is delineated, with special attention being given to water regions, water requirements and water supplies, as well as water quality. Factors of flow, requirements, and supply functions of the water resources are presented by provinces, and defined both hydrologically and economically. The results of the model include comparisons between physical requirements and physical supplies, assumptions of optimal water resource development limitations, effects of marginal cost constraints, and various alternative allocation adaptations to water shortages. Projections for future procedures also resulted, focusing particularly on the problems of relating water regulation to the Chilean agricultural sector. (Murphy-Rutgers)
W71-08280

6E. Water Law and Institutions

UNITED STATES OCEANS POLICY: AN ANALYSIS,
Leigh S. Ratiner.
Journal of Maritime Law and Commerce, Vol 2, No 2, p 225-266 (1971). 42 p, 71 ref.

Descriptors: *International waters, *International law, *Oceans, *United States, Continental margin, Treaties, United Nations, Foreign countries, Continental Shelf, Beds, Coasts, Fishing, Commercial fishing, Navigation, Mineralogy, Oil, Fisheries, Technology, Exploration, Exploitation, Natural resources, Law of the sea, Water pollution, Beaches, Military aspects.
Identifiers: *Territorial sea.

Analyzing the oceans policy of the United States, as enunciated by President Nixon and proposed in a draft convention on the international seabed area, this article examines the problem from four perspectives: (1) historical, (2) United States national interests, (3) foreign national interests, and (4) international interests. The article first traces the proliferation of unilateral declarations by nations regarding their jurisdiction over adjacent sea areas. The resulting chaos has brought about efforts to reach an international agreement on the territorial sea and other rights in sea areas. Secondly, the article lists the various United States interests in oceans which include fishing, natural resources exploitation, pollution, military considerations, and navigation. The third section deals with the varying interests of foreign nations, categorizing nations into groups which reflect their geographic and economic situations regarding seabed jurisdiction. The final section considers the international community's interest in oceans and examines specifically the new United States policy and proposed international convention on the seabed area. The United States proposal covers: (1) the territorial sea, (2) the continental shelf boundary, (3) rights in living resources of the sea, (4) rights in mineral resources of the seabed, and (5) navigation through international straits. It creates international machinery to govern the seabed area, balances various interests, and serves as a basis for further negotiation. (Duss-Florida)
W71-07707

STATEMENTS ON PROPOSED FEDERAL ACTIONS AFFECTING THE ENVIRONMENT.
Council of Environmental Quality, Washington, D.C.

Federal Register, Vol 35, No 92, p 7390-7393 (May 1970). 4 p.

Descriptors: *Administrative agencies, *Legislation, *Environment, *Ecology, Administration, Budgeting, Coordination, Legal aspects, Decision making, Federal government, Regulation, Governments, State governments, Environmental effects, Federal budgets, Local governments.
Identifiers: *National Environmental Policy Act of 1971.

Pursuant to section 102 (2) (c) of the National Environmental Policy Act of 1971 and Executive Order 11514, the Council of Environmental Quality herein proposes the procedures to be followed by all federal agencies in complying with the Act. Types of agency actions which may require the preparation of environmental statements providing timely public information on federal plans and programs with environmental impact are discussed and defined. A procedure for legislative proposals and recommendations is also outlined. This memorandum specifies the required content of environmental statements. Federal agencies with expertise or jurisdiction in applicable areas are to be consulted in connection with the preparation of environmental statements. There are also provisions for state and local review of proposed action. These environmental statements are to be used in agency review processes and made public. Federal agencies will review their existing authority to determine whether there is anything which prohibits their full compliance with the National Environmental Policy Act and shall make proposals to bring their authority and policies into compliance with the Act. (Robinson-Florida)
W71-07708

WATER POLLUTION,
Peter J. Ryan.
Albany Law Review, Vol 35, No 2, p 198-218 (1971). 21 p, 145 ref.

Descriptors: *Water pollution control, *Water pollution, *Pollution abatement, *Regulation, Waste water (Pollution), Water law, Federal government, State governments, Local governments, Legal aspects, Legislation, Interstate commissions, Thermal pollution, Wastes, Water quality, Water quality control, Water Quality Act, Water treatment, Sewage disposal, Waste treatment, Sewage treatment, Rivers and Harbors Act, Judicial decisions.

Discussed in this article are the various types of water pollution including mercury, phosphate detergents, and thermal pollution and regulation thereof. The water pollution problems of New York City are examined, particularly the Jamaica Bay ecological study and the city's water supply. The article traces the development of common law for the control of water pollution with emphasis on several important cases. Water pollution regulation by the following governmental bodies is also examined: (1) New York City; (2) Interstate Sanitation Commission of Connecticut, New Jersey, and New York; and (3) federal agencies. The Rivers and Harbors Act of 1899, Federal Water Pollution Control Act, and the Water Quality Act of 1965 are evaluated as examples of federal control. The problems of enforcing anti-pollution laws are examined, and the Michigan statute granting to
private citizen the right to sue pollutors on be
of the general public is discussed. The author f
that a well-informed and concerned populace is
most potent weapon in the fight to save our
vironment. (Robinson-Florida)
W71-07709

**WATER CLASSIFICATION STANDA
SYSTEM FOR THE STATE OF SOU
CAROLINA.**
South Carolina Pollution Control Autho
Columbia.

Water Classification Standards System, S
Carolina Pollution Control Authority (1967). 1

Descriptors: *South Carolina, *Standards, *W
quality control, *Classification, Water pollu
control, Water pollution sources, Water per
Water policy, Water quality, Legal aspects,
ministrative decisions, State governments,
waters, Fresh water, Decision making, Supervi
control (Power), Regulations, Administra
Non-structural alternatives, Water utiliza
Water users, Commercial fishing, Waste dispos
Identifiers: *Administrative regulations.

Pursuant to statutory authority, nine water cla
cations and accompanying quality standards,
and definitions are herein promulgated by
South Carolina Pollution Control Authority.
classes and standards are intended to protect p
health and to maintain water quality for aq
life. No treatable wastes shall be dischs
without treatment. Compliance tests shall be
under approved procedures of the Pollution
trol Authority. Where specific standards are
plicable, state waters shall be free from:
sewage, industrial, or other wastes; (2) flo
debris, oil, grease, scum, etc.; (3) subst
producing changes in water taste, odor, or
and (5) high-temperature, toxic, or other del
ous substances. Fresh water classifications ar
class AA--suitable for domestic or food proce
with only disinfection treatment; (2) clas
swimming waters; (3) class B--domestic use
complete treatment; (4) class C--suitable fo
propagation, industrial, and agricultural use
(5) class Cal--fish survival, industrial, and ag
tural use. Tidal salt water classes are: (1) class
market shellfishing or any other use; (2) clas
bathing or any other use except market shellfi
(3) class SC--any usage except bathing and m
shellfishing. Fresh and salt-water classificatio
clude quality standards providing specific tole
limits. (Earl-Florida)
W71-07710

**ASSOCIATION LOAN AND G
ASSISTANCE FOR SOIL AND WATER FA
TIES, INCLUDING WASTE DISP
RECREATION, GRAZING, AND O
FACILITIES.**
Secretary of Agriculture, Washington, D.C.

Code of Federal Regulations, Title 7, Chap
Secs 1823.1 thru 1823.50 (1970). 24 p.

Descriptors: *Loans, *Grants, *Gover
finance, *Rural areas, Costs, Economics, F
government, State governments, Local g
ments, Administration, Legal aspects, Wat
icy, Water resources development, Drainag
conservation, Grazing, Forestry, Agric
Recreation, Waste disposal, Water require
Water supply, Capital supply, Credit, Financ

Outlined herein are the policies and authori
providing financial assistance to rural comm
and other rural associations for water,
disposal, drainage, recreation, grazing, fo
and other necessary soil and water facilities.
may be made to install or improve com
water facilities, including works for the de
ment, storage, treatment, purification, and di
tion of water. Loans may also be obtained fo

ty waste disposal facilities and water facilities
ire protection. Rural community outdoor
ational facilities, including domestic water, ir-
on, drainage, and waste disposal facilities
oped in connection with recreational areas,
ligible for loans. Loans may be obtained for
control facilities such as dikes, terraces, de-
n reservoirs, stream channels, and ditches to
ce soil conservation. Development grants
e made to assist in financing specific projects
evelopment, storage, treatment, purification,
listribution of domestic water. The various
dures that must be followed to obtain a loan
nt are explained, as are the responsibilities of
oncerned governmental agencies. Govern-
l officers with loan and grant approval
rity are specified. (Robinson-Florida)
07711

**ED STATES V 327 ACRES OF LAND
ANCEMENT OF CONDEMNED PROPER-
ALUE DUE TO PROXIMITY TO EARLIER
ECT).**
Supp 844-848 (ND Ga 1971).

iptors: *Condemnation value, *Appreciation,
l appraisal, *Dams, Condemnation, Eminent
in, Compensation, Engineering structures,
ites, Flow control, Hydroelectric power, Im-
lments, Reservoirs, River regulation, United
, Georgia, River basins, Water control, Water
e, Hydroelectric plants, Federal government,
ation, Economic impact, Judicial decisions,
aspects, Multiple-purpose projects.

iff United States brought action to condemn
rty for construction of a regulation dam and
ndment area. Plaintiff contended that the
vas part of a larger hydroelectric power pro-
nd that, as such, defendant landowner should
e for compensation the value of the lands
mned without an allowance for enhanced
due to proximity to the project. Defendant
wner contended that the regulation dam was
ithin the original scope of the project, and
e value of the land should include its value as
ced by the factor of proximity. On the
inary motion, the United States district court
that evidence as to enhanced value of the
vas admissible. The court noted that long his-
f the power project, during which the regula-
dam concept had been rejected. After a
ct tract has been condemned, the govern-
at a later date, must pay the market value of
ldditional land as enhanced by proximity to the
al project, unless such additional land was
mplated as a part of the original plan. (Smil-
-Florida)
07712

**ED STATES V 901.89 ACRES OF LAND
UE OF RETAINED LAND ENHANCED BY
DEMNATION FOR PUBLIC PROJECT).**
2d 395-401 (6th Cir 1970).

iptors: *United States, *Condemnation
*Land appraisal, *Appreciation, Impounded
, Condemnation, Eminent domain, Compen-
, Economic impact, Dams, Damsites, Lakes,
shores, Aesthetics, Appraisals, Recreation,
control, Boundaries (Property), Judicial
ons, Federal government, Legal aspects.

iff United States brought condemnation
edings against defendant landowner. Plaintiff
nded that an award for compensation of the
ondemned for construction of a dam should
nto consideration the enhancement of value
ined land due to its proximity to the created
Defendant contended that enhancement of
ed land value was a general benefit which was
be considered in awarding compensation. In
ing a lower court award for defendant, the
d States Court of Appeals, Sixth Circuit, or-
that the increase in value of retained land
proximity to the lake should be considered
rding compensation. The court distinguished
general benefits, which arise from the fulfillment of the public object that justified the taking, and special benefits that arise from the peculiar relation of the land in question to the public improvement. General benefits are not included in valuation of retained land, but special benefits are properly included. The proximity of retained land to a created lake falls within the category of a special benefit. (Smiljanich-Florida)
W71-07713

SALINE WATER CONVERSION PROGRAM--APPROPRIATION.
Public Law 91-221, 84 Stat 87, 4 US Code Cong and Admin News p 534-535 (1970). 2 p.

Descriptors: *Saline water, *Desalination, *Government finance, *Desalination apparatus, Desalination plants, Federal government, Water sources, Financing, Costs.
Identifiers: *Saline Water Conversion Act.

The following appropriations for efforts under provisions of the Saline Water Conversion Act are authorized by this law: (1) $16,150,000 for research and development operating expenses, provided that no more than $100,000 may be obligated for procurement of research services from foreign nations; (2) $5,000,000 for design, construction, acquisition, modification, operation, and maintenance of saline water conversion test beds; (3) $5,345,000 for design, construction, acquisition, modification, operation, and maintenance of saline water conversion modules; and (4) $2,378,000 for administration and coordination. Expenditures for any of these four areas may be increased by 10% with a commensurate decrease in expenditures under other areas. (Hart-Florida)
W71-07714

ENVIRONMENT,
Richard M. Nixon.
116 Cong Rec H 743 (daily ed) 2 US Code Cong and Admin News, p 112-123 (1970). 12 p.

Descriptors: *Environment, *Water pollution control, *Air pollution, *Water pollution, Parks, Recreation, Water pollution sources, Cities, Industry, Farm wastes, Agricultural chemicals, Real property, Administrative agencies, Administrative decisions, Administration, Pollutants, Pollution abatement, Ecology, Federal project policy, Environmental effects, Solid wastes, Waste disposal.

President Nixon's 1970 environmental message to Congress discusses pollution abatement measures in several areas of environmental deterioration. Water pollution is stated to have three principal sources: (1) municipal, (2) industrial, and (3) agricultural. Surprisingly, pollution from agricultural sources is considered the most troublesome. The phaseout of DDT is cited as an action taken to abate agricultural pollution. President Nixon proposes various means of abating municipal pollution, including creation of an Environmental Financing Authority to assist municipalities in selling waste treatment construction bonds. The present industrial pollution abatement program is criticized for lack of an effluent standard. Seven proposals are submitted to correct industrial pollution. In two subparts, motor vehicular and stationary source pollution, the President proposes corrective measures with respect to air pollution. In a discussion of solid waste management President Nixon proposes programs for re-use or processing of disposable containers and junk autos. More efficient use of federal land for parks and public recreation is recommended. A final section suggests methods for implementing environmental improvement proposals. (Hart-Florida)
W71-07715

CLEAN AIR AND CLEAN WATER SCHOLARSHIP INTERN PROGRAMS--QUALIFIED DEGREES.
New Jersey Session Law Service, ch 274 (1970). 3 p.

Descriptors: *New Jersey, *Scientific personnel, *Education, *Engineering education, Employment opportunities, Professional personnel, Air pollution, Water pollution, Environmental engineering, Universities, Colleges, Grants, Training, Financing, Employment, Occupations, Contracts, Wages, Administrative agencies, State governments, Legislation, Social aspects, Legal aspects, Schools (Education).
Identifiers: *Environmental scholarships.

Clean air and clean water scholarship intern programs are established whereby the New Jersey Department of Environmental Protection may provide payment of room, board, tuition, and fees for eligible persons on a competitive basis. The persons must attend authorized universities as regular students and receive an engineering degree or a degree with a major in the biological, physical, or environmental sciences. Among other qualifications, the student must contract, with the consent of his parent or legal guardian if he is a minor, to serve with the Department of Environmental Protection for a period of three years following graduation. The student must also agree to serve with the Department during his summer vacations. The Department shall not be liable to pay wages to the student during these vacation periods. (Smiljanich-Florida)
W71-07716

MARINE POLLUTION PROBLEMS AND REMEDIES,
Oscar Schachter, and Daniel Serwer.
American Journal of International Law, Vol 65, No 1, p 84-111 (1971). 28 p, 83 ref.

Descriptors: *International waters, *Water pollution control, *Water pollution sources, *International law, Water pollution, Pollution abatement, Water pollution effects, Aquatic environment, Oil, Oily waters, Chlorinated hydrocarbon pesticides, Coasts, Ships, Waste disposal, Pollutants, Sea water, Treaties, International commissions, Administrative agencies, United Nations, Foreign countries, Governments, Remedies, Legal aspects.

Marine pollution is a global problem of great magnitude. No single measure or type of measure on either the national or international level is adequate to meet the range of marine pollution problems. Marine pollution control measures must be tailored carefully to fit particular problems. A summary is made of what is known about pollution sources, the extent to which they are found in the marine environment, how they affect the marine environment, what international controls now apply, and the prospects for future pollution and its control. Four specific marine pollution problems and their remedies are discussed. These include pollution caused by oil, chlorinated hydrocarbons, wastes discharged from coasts, and wastes dumped from vessels. The international machinery used to deal with these problems has not been effective. Comprehensive international conferences on the problems are needed, along with a greater recognition of the need for regional pollution control organs. A large part of the solution also lies in making old institutions more effective and maintaining the needed pressure from scientists, professional groups, and the public at large. (Smiljanich-Florida)
W71-07717

NATIONAL WATER QUALITY STANDARDS ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
Senate Bill 523, 92d Cong, 1st Sess Feb 2, 1971. 48 p.

Descriptors: *Water quality control, *Water pollution, *Water pollution control, *Legislation, Water quality, Federal government, State governments, Local governments, Coordination, Waste treatment, Treatment facilities, Water policy, Standards, Regulation, Sewage, Water pollution sources, Costs, Cost sharing, Grants, Government finance, Public rights, Environment, Environmental effects, Bodies of water, Administrative agencies.
Identifiers: *National Water Quality Standards Act of 1971, *Federal Water Pollution Control Act.

Amending the Federal Water Pollution Control Act, the proposed National Water Quality Standards Act of 1971 seeks to: (1) establish water quality standards and provide for their revision, (2) provide federal assistance to state and local governments for construction of waste treatment facilities, (3) provide improved assistance to state and interstate water pollution control agencies in the area of water pollution control and water quality enhancement, (4) improve water quality enforcement measures, and (5) assure public participation in federal programs relating to the quality of the nation's waters. The Act would authorize the Administrator of the Environmental Protection Agency to make grants to state and interstate agencies for water quality and pollution control programs and assist in various aspects of their implementation. Subsections cover procedural requirements, discretion of the Administrator, and funding of programs. The Administrator is authorized to make grants for the construction of waste treatment works. Subsections govern the implementation of this provision. The Act calls for formulation and implementation of water quality control and enhancement programs. Factors to be considered and procedures to be followed in approving and coordinating such plans are outlined. Federal enforcement procedures include both civil and criminal penalties for violation of various portions of the Act. (Duss-Florida)
W71-07718

SANTA BARBARA CHANNEL MORATORIUM AND ECOLOGICAL PRESERVE ACT (A BILL TO PROVIDE FOR A FEDERAL ECOLOGICAL PRESERVE IN A PORTION OF THE OUTER CONTINENTAL SHELF).

Senate Bill 373, 92d Cong, 1st Sess, Jan 27, 1971. 9 p.

Descriptors: *Leases, *Oil, *Channels, *Water pollution sources, Pollution abatement, Oil fields, Water quality control, Federal government, Legislation, Coasts, Shores, Drilling, Beds under water, Pacific Ocean, Ownership of beds, Gases, Mineralogy, Wildlife management, Oil industry, Oil reservoirs, Oil wells, Oily water, Offshore platforms, Exploitation, Legal aspects, Navigation.

In response to recent events concerning the Santa Barbara Channel oil spill, the Santa Barbara Channel Moratorium and Ecological Preserve Act would regulate future oil production and create a federal ecological reserve in the area. Present drilling and production methods constitute an environmental and navigational hazard and a threat to Santa Barbara and its submerged lands sanctuary. The Act would terminate certain leases in the channel with just compensation from appropriations provided herein. The areas in which the leases are terminated would become a federal ecological preserve, which would not be subject to drilling for or production of oil, gas or other minerals. Drilling on certain other leases would be suspended until the Secretary of the Interior insures that future oil spillage can be prevented, ecological hazards can be minimized, and underwater production techniques have been perfected and will be used so that no apparatus is visible above the surface of the water or creates a navigational hazard. Three leases would be allowed to continue operating until oil spillage and leaks in the channel have been minimized. (Smiljanich-Florida)
W71-07719

WATER RIGHTS ACT OF 1971 (A BILL TO CLARIFY THE RELATIONSHIP OF INTERESTS OF THE UNITED STATES AND OF THE STATES IN THE USE OF THE WATERS OF CERTAIN STREAMS).
Senate Bill 28, 92d Cong, 1st Sess, Jan 25, 1971. 5 p.

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Compensation, *Legislation, Water resources development, Regulation, Federal government, State governments, Governments, Federal jurisdiction, State jurisdiction, Water rights, Legal aspects, Administration, Condemnation value, Prior appropriation, Riparian rights, Competing uses, Prescriptive rights, Water sources, Water utilization, Water resources, Water supply.

Under this proposed legislation the withdrawal or reservation of surveyed or unsurveyed lands of the United States would not affect any right to the use of navigable or non-navigable water acquired pursuant to state law either before or after the establishment of such withdrawal. In the latter case a federal statute or a promulgation by an appropriate officer of the United States of the purpose, quantity, and priority date of the water right reserved to the United States would defeat rights under state law. No right to diversion, storage, distribution, or use of water which the United States asserts to have been established under the laws of a state shall be greater or less than those accorded by the laws of that state to other users. No vested water rights shall be taken or used by the United States without just compensation. If works of the United States interfere with any vested compensable water rights, the United States shall initiate eminent domain proceedings. If this is not done, no statute of limitations shall apply against a suit by an injured party for compensation. (Robinson-Florida)
W71-07720

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROTECT THE NAVIGABLE WATERS OF THE UNITED STATES FROM FURTHER POLLUTION BY REQUIRING THAT PESTICIDES COMPLY WITH CERTAIN STANDARDS OF BIODEGRADABILITY AND TOXICITY.
Senate Bill 281, 92d Cong, 1st Sess, Jan 26, 1971. 3 p.

Descriptors: *Water pollution control, *Pesticide toxicity, *Legislation, *Biodegradation, Pesticide residues, Federal government, Water quality control, Navigable waters, Pesticides, Fungicides, Herbicides, Pesticide removal, Public health, Environmental sanitation, Chemical wastes, Pollutants, Water pollution sources, Nonstructural alternatives, Water quality, Hazards, Insecticides, Legal aspects, Regulation, Administration.
Identifiers: Federal Water Pollution Control Act.

This proposed amendment to the Federal Water Pollution Control Act mandates pesticide biodegradability and toxicity standards and prohibits the manufacture or importation of substandard pesticides. Under the bill, the Secretary of the Interior would be required to prescribe standards and rules preventing non-conforming pesticide manufacture by January 1, 1973. The Secretaries of the Interior and the Treasury would be required to promulgate rules preventing the importation of such pesticides. All standards and rules promulgated under this bill would become effective July 1, 1973. Willful violation of the provisions of this bill or pursuant regulations would constitute a misdemeanor. First offenses are punishable by a fine not exceeding $500. Subsequent offenses are punishable by a fine not exceeding $2,000. As used in this bill 'pesticide' means any fungicide, herbicide, rodenticide, or insecticide. (Earl-Florida)
W71-07721

A BILL TO PRESERVE AND PROMOTE THE RESOURCES OF THE CONNECTICUT RIVER VALLEY.

Senate Bill 318, 92d Cong, 1st Sess, Jan 27, 1
15 p.

Descriptors: *Interstate rivers, *New Engl
*National historic sites, *Preservation, Fed
government, State governments, Legisla
Eminent domain, Condemnation, Scenic
ments, History, Ecology, Recreation, Acreage
dustrial production, Natural resources, Conse
tion, Inter-agency cooperation, Riparian
Shore protection, Beach erosion, Legal asp
Standards, Regulation.

In order to provide for the conservation o
scenic, historic, ecological and recreational v
of the Connecticut River Valley, this bill w
establish the Connecticut Historic Riverway.
Secretary of the Interior would be authorize
condemn lands necessary to carry out the pur
of the Act. The Secretary would also be autho
to specify standards regulating new commerci
industrial uses of such property and promoti
protection and development by means of acr
frontage, setback design, and subdivision con
The primpary aim of the Act would be the co
vation of the natural resources located withi
Riverway and the preservation of the area
nearly its natural state and condition as pos
Advisory committees would represent the va
states in which the Riverway is located. Inter-
cy cooperation would foster plans for sho
erosion control along the Connecticut River. (
janich-Florida)
W71-07722

**LAND AND WATER RESOURCES PLANN
ACT OF 1971 (A BILL TO AMEND
WATER RESOURCES PLANNING ACT T
CLUDE PROVISION FOR A NATIONAL L
USE POLICY).**
Senate Bill 632, 92d Cong, 1st Sess, Feb 5,
56 p.

Descriptors: *Water Resources Planning
*Land use, *Land development, *Water reso
development, Planning, Land resources,
management, River basin commissions, L
tion, Federal government, State governm
River basin development, Water policy,
Grants, Long-term planning, Federal projec
icy, Coordination, Administration, Environm
effects, Social aspects, Legal aspects.
Identifiers: *Land and Water Resources Pla
Act.

Pursuant to findings that a comprehensiv
proach to land use management is needed, t
would amend the Water Resources Planning
include provision for a national land use pol
broadening the authority of the Water Res
Council and river basin commissions a
providing financial assistance for statewid
use planning. The Land and Water Res
Planning Act of 1971 would: (1) establish a
and Water Resources Council with autho
coordinate land and water policy in the natio
authorize establishment of river basin comm
to include coordination of plans for the de
ment of land and water resources in the rive
area; and (3) provide for a national land use
The land use policy would be implemented t
statewide and interstate land use planning
and state water resources planning grants. T
tional land use policy would entail lan
planning and development in accordance wi
sound ecological principles, (2) be
economic activity, (3) favorable populatio
tribution, and (4) coordination of state and
activities. (Smiljanich-Florida)
W71-07723

**MARSHALL V HARTMAN (RIPARIAN R
ON LAND ABUTTING PUBLIC STREET).**

139 So 441-448 (Fla 1932).

criptors: *Florida, *Navigable waters, *Riparights, *Riparian land, Easements, High water k, Beds, Channels, Landfills, Cities, Land re, Contracts, Legal aspects, Judicial decis, Boundaries (Property), Boundary disputes, ds.

tiff sought rescission of a contract to buy land. tiff alleged that defendant vendors falsely esented that the land possessed riparian rights that the contract itself called for riparian s. Defendants denied the allegations and con- ed that they never claimed any riparian rights that the contract conveyed only such rights as had. Defendants asked for specific per- ance. The trial court found for plaintiff and Supreme Court of Florida reversed. The con- did not purport to assert any riparian rights. reference to riparian rights in the contract con- d only those rights which might be found to ex- The vendee was on notice that the land might have any riparian rights because of the nce of the city street on the edge of the pro- and the city's landfill between the street and iver. The general rule is that a grantee of land ing a street, whose grantor owned title under treet, is presumed to own soil to the center of treet subject to the public easement, and is not d with riparian rights in water or submerged abutting the opposite side of the street. (Duss- da)
-07739

RD OF PURIFICATION OF WATERS V 'N OF EAST PROVIDENCE (STATE 'ER TO REQUIRE CITY TO ABATE POL- ION OF RIVER).
A 812-815 (RI 1926).

riptors: *Rhode Island, *Administrative agen- *Water pollution, *Water pollution control, r purification, Sewage, Sewage treatment, s, Public health, Water pollution sources, r pollution effects, Prescriptive rights, Costs, lation, Sewage effluents, Cities, Legal aspects, ial decisions, Pollution abatement, Regula-

tiff Rhode Island Board of Purification of rs instituted proceedings to require defendant of East Providence to implement a system to nt pollution of a river. Defendant was dump- aw sewage into the river. Plaintiff issued an for defendant to adopt a system to prevent tion, and defendant appealed to the Supreme t of Rhode Island. Defendant questioned the itutionality of the law creating and giving rs to the plaintiff and the reasonableness of oard's order. The act creating the Board and g it powers relating to pollution of waters was n the police power of the state to protect c health. The act was not an ex post facto law elated to anticipated future actions. The right llute public waters and endanger public health ot be acquired as a private property right. No an acquire a prescriptive right to endanger c health by discharging sewage into public s. The state cannot be required to pay the of- r for discontinuation of the practice. Plain- order was not unreasonable and defendant's on and delay in financing the needed system ot justified. (Duss-Florida)
-07741

OF NORWOOD V SHEEN (DAMAGES SEWAGE FLOW ON PRIVATE PROPER-

E 102-107 (Ohio 1933).

riptors: *Ohio, *Eminent domain, *Sewage sal, *Damages, Sewers, Sewage, Land, Land e, Drains, Water pollution, Drainage systems, low, Surface waters, Pipes, Storm drains, ls, Cities, Waste water (Pollution), Wastes, e disposal, Compensation, Legal aspects, Judiecisions.

Plaintiff executor brought suit for damages against defendant city for appropriation of decent's property. Plaintiff alleged that defendant had taken over a private sewer during decendent's lifetime and operated it so as to flood and pollute decendent's property. Plaintiff charged that this amounted to an appropriation of the property. Defendant contended that: (1) plaintiff's action was grounded in negligence and could not be maintained in the absence of a negligence statute governing the operation of sewers; (2) there was no appropriation; and (3) the issue of damages was improperly submitted to the jury. Plaintiff recovered at the trial level. The Supreme Court of Ohio reversed on the issue of damages. Plaintiff's action was not grounded in negligence, but was based on appropriation of private property for a public use. The petition alleging that defendant used the sewer and drain facilities so as to cause flooding and pollution of property stated a good cause of action against defendant for temporary appropriation of private property for a public use. However, since the injury was not permanent, evidence regarding the value of the land was not admissible, and the trial court should have charged the jury as to what measure of damages was applicable. (Duss-Florida)
W71-07742

WILSON V CITY OF LAURENS (DAMAGES DUE TO NEGLIGENT CONSTRUCTION OF DRAINAGE SYSTEM).
132 SE 590-591 (SC 1926).

Descriptors: *South Carolina, *Drainage systems, *Surface drainage, *Surface runoff, Drains, Eminent domain, Damages, Compensation, Benefits, Cities, Construction, Maintenance, Floods, Diversion, Surface waters, Judicial decisions, Legal aspects.

Plaintiff landowner sought damages from defendant city for flood damages to his property due to defendant's negligent construction and maintenance of a drainage system. Plaintiff alleged that defendant altered the drainage system so that in time of flood, water was diverted onto plaintiff's property. Defendant contended that: (1) the improvements were made properly, (2) they benefited plaintiff's property, and (3) no damage to plaintiff resulted from any defect in the drainage system or anything under defendant's control. In the trial court the jury returned a verdict for plaintiff. Defendant appealed on the grounds that plaintiff should have brought his action under a statute requiring compensation for damages arising from street improvements, and that the trial judge failed to properly charge the jury concerning the benefits of the system. The Supreme Court of South Carolina affirmed. Plaintiff's cause of action was grounded in the city's failure to provide a proper system of surface drainage, and required no statutory basis. Because of plaintiff's theory of negligence, no charge regarding benefits was necessary. (Duss-Florida)
W71-07744

ROSE ISLAND CO V UNITED STATES (DAMAGES TO AMUSEMENT PARK BY OVERFLOW FROM DAM BACKWATER).
46 F2d 802-804 (WD Ky 1930).

Descriptors: *Dams, *Backwater, *Compensation, *Streams, Non-navigable waters, Riparian land, Riparian waters, Damages, Real property, Parks, Boating, Recreation, United States, Legal aspects, Judicial decisions.

Plaintiff riparian landowner sued for compensation when defendant United States' dam caused his land to be overflowed. A small non-navigable stream flowed through plaintiff's land into the Ohio River. Defendant's dam caused the water to rise in this stream. Plaintiff used the property as an amusement park and asserted that the increased depth of the stream lessened its attractiveness as a boating stream for the park. The Federal District Court held that defendant must compensate plaintiff for any injury caused by the dam. However, the lessening of the stream's attractiveness for boating was held too conjectural and uncertain to permit recovery. Recovery was allowed for injury to plaintiff's parking lot and for narrow strips of plaintiff's property along the creek which were permanently submerged. (Hart-Florida)
W71-07745

DALCHE V BOARD OF COMM'RS OF ORLEANS LEVEE BD (CONSTITUTIONALITY OF TAKING RIPARIAN LAND FOR RESIDENTIAL PROPERTY).
49 F2d 374-385 (ED La 1931).

Descriptors: *Lakes, *Eminent domain, *Flood control, *Marshes, Condemnation, Real property, Riparian land, Riparian waters, Compensation, Payment, Legislation, State governments, Cities, Legal aspects, Judicial decisions, Louisiana.
Identifiers: *Constitutionality.

Plaintiff landowner sought to enjoin defendant board of commissioners from condemning his riparian land. Plaintiff contended that the proposed taking was for a private purpose in violation of the 14th amendment. Defendant planned to erect a sea wall along plaintiff's property and to reclaim a portion of lake bottom and marshlands. The area thus taken was to be converted into a residential section. Thirty per cent of the property was to be dedicated for a public amusement park. The project would eliminate flooding of New Orleans and alleviate mosquito proliferation. The Federal District Court held that a proper public purpose was performed by the project and rejected plaintiff's contention. Plaintiff's suit was dismissed, the court noting that a right of action for compensation existed. (Hart-Florida)
W71-07748

UNITED STATES V KINCAID (INJUNCTION TO PREVENT FLOOD CONTROL PROJECT PROCEEDING UNTIL LAND TO BE OVERFLOWED HAS BEEN ACQUIRED).

49 F2d 768-769 (5th Cir 1931).

Descriptors: *Mississippi River, *Flood control, *Flooding, *Eminent domain, Condemnation, Real property, Riparian land, Riparian waters, Administrative agencies, Compensation, Remedies, Legal aspects, Judicial decisions, Federal government, United States.

Plaintiff riparian landowner sought to enjoin defendant United States from proceeding with a flood control project which would subject plaintiff's land to more severe flooding. The land had not been acquired for flooding either by purchase or condemnation. The Fifth Circuit Court of Appeals granted an injunction until defendant had acquired the property or flowage rights thereon. (Hart-Florida)
W71-07749

UNITED STATES V BOYNTON (BOUNDARY OF RIPARIAN LAND WHICH HAD BEEN MEANDERED).
53 F2d 297-298 (9th Cir 1931).

Descriptors: *Accretion (Legal aspects), *Boundary disputes, *Meanders, *Land tenure, Real property, Boundaries (Property), Riparian land, Riparian waters, United States, High water mark, Tides, Legal aspects, Judicial decisions, Surveys.

Plaintiff United States brought action to quiet title to accretions to riparian land on an Indian reservation. The land had been surveyed by the United States for allotment to individual members of the tribe. The surveyor meandered along the water. Plaintiff contended that the boundary of the tract was the high water mark; defendant asserted that the boundary was fixed by the survey. To prove its

contention, plaintiff endeavored to show that the survey had merely meandered along the water line to designate the high water mark generally. Meander lines were defined as referring to the water line itself, subject to tides and water levels. The United States Court of Appeals determined that meander lines were not normally fixed boundaries; hence, the court concluded that the conveyance must expressly provide that the meander was a fixed boundary to alter that rule. Since the conveyance was silent on the matter, the court held that the high water mark, rather than the meander, was the boundary of the tract. (Hart-Florida)
W71-07750

LIPSCOMB V GIALOURAKIS (TERRITORIAL BOUNDARIES OF GULF STATES).
133 So 104-107 (Fla 1931).

Descriptors: *Florida, *Gulf of Mexico, *Boundary disputes, *Jurisdiction, Gulfs, Legal aspects, Judicial decisions, State governments, Governments, Legislation, Bodies of water, Local governments, Fishing, Commerical fishing, State jurisdiction.

Defendants were tried for using illegal methods to catch sponges and for taking sponges below the minimum size in the Gulf of Mexico. The state appealed a judgment by the Circuit Court of Taylor County discharging the accused. Defendants contended that the indictment showed on its face that the offense was not committed within the jurisdiction of Taylor County. The Supreme Court of Florida reversed the judgment and held that the indictment sufficiently charged that a statutory offense had been committed within the jurisdiction of Taylor County. All the bottoms of the gulfs and natural bays within the limits of the State of Florida passed to the State of Florida when Florida was admitted to the Union. The counties bordering on the Gulf of Mexico include that area within the Gulf adjacent to the upland and extending to the state boundary line. (Robinson-Florida)
W71-07754

CITY OF BIRMINGHAM V FLOWERS (DAMAGES RESULTING FROM IMPROPER CULVERT).
140 So 353-356 (Ala 1932).

Descriptors: *Alabama, *Controlled drainage, *Culverts, *Flood damage, Legislation, Judicial decisions, Drainage, Surface drainage, Drains, Engineering structures, Structures, Channels, Conduits, Local governments, Governments, Damages, Flood control, Floods, Water injury, Legal aspects.

Plaintiff landowner sued defendant city for damages to property caused by an overflow of water from a culvert. Defendant alleged as error the refusal of the following charges to the jury: (1) the jury could not award any damages to plaintiff for negligent construction of the culvert, since the complaint asserted only negligence in maintenance, and (2) the failure of plaintiff to report the overflow within a reasonable time defeated his right to recover. Defendant also challenged an instruction stating that, if a reasonable man should have known that the culvert was insufficient, defendant should be held liable for damages. The trial court rendered judgment for plaintiff, and the Supreme Court of Alabama affirmed. The complaint charging defendant with maintaining a permanent, inadequate culvert stated a single cause of action for permanent damage. If the drainage system itself was proper, and the damage resulted from inadequate maintenance, each recurring injury created a separate cause of action. The measure of damages for permanent injury was properly the difference in value of the land before and after the overflows, present and prospective. The complaint was not defective in failing to assert negligence in construction, since negligent construction also constitutes negligent maintenance. (Robinson-Florida)
W71-07824

SEWER AND ENVIRONMENTAL ASPECTS OF WATER QUALITY STANDARDS,
For primary bibliographic entry see Field 05G.
W71-07848

THE DESIGNATION OF THE AREA AND THE WATER QUALITY STANDARD OF THE RIVER KANO,
For primary bibliographic entry see Field 05G.
W71-07851

CLEVELAND FACES POLLUTION SUIT.
For primary bibliographic entry see Field 05G.
W71-07853

MARTIN V GRAVITY DRAINAGE DIST NO 14 (ENLARGING GOV'T DRAINAGE DITCHES ON PRIVATE LAND).
143 So 93-95 (La Ct App 1932).

Descriptors: *Louisiana, *Ditches, *Drainage districts, *Controlled drainage, Legislation, Judicial decisions, Legal aspects, Governments, State governments, Local governments, Damages, Drainage systems, Drainage engineering, Drainage programs, Drainage, Drainage water, Drainage practices, Water control, Channeling, Channels, Canals, Land tenure, Real property, Eminent domain, Remedies.

Plaintiff landowner sued defendant drainage district for damages ensuing when defendant widened and deepened an old drainage ditch on plaintiff's property and piled the excavated dirt on plaintiff's land. Plaintiff contended that he had lost 2.18 acres of land. Defendant alleged that the ditch was not made any deeper or wider than was necessary and the the spoil dirt had to be piled on plaintiff's land. Defendant further argued that plaintiff was estopped from bringing the action by his silence at the time of the work and that the benefits exceeded the damages. Defendant also alleged that it had control over 100 feet on each side of the ditch under a Louisiana statute. The trial court dismissed the complaint. The Louisiana Court of Appeal affirmed, stating that plaintiff had not proven the extent of his damages. The court held that the statute giving the drainage district control of 100 feet on both sides of the ditch did not deprive landowners of the right to recover the value of the land taken. The fact that benefits exceed damages is no defense, since a plaintiff is assumed to pay for these benefits by payment of taxes. (Robinson-Florida)
W71-07862

CITY OF VICKSBURG V PORTERFIELD (CITY'S RESPONSIBILITY TO MAINTAIN DRAINS FREE OF OBSTRUCTION).
145 So 355-357 (Miss 1933).

Descriptors: *Mississippi, *Floods, *Flood damage, *Storm drains, Land tenure, Land use, Legal aspects, Public rights, Judicial decisions, Local governments, Governments, Drainage, Drainage water, Drainage engineering, Controlled drainage, Drains, Culverts, Sewers, Flood control, Overflow, Storm runoff, Water injury, Water control.

Defendant city allowed a drain pipe to become clogged so that during a hard rain the water rose and flooded the property of plaintiff. Plaintiff sought damages. Defendant contended that the rain was excessive and that it was not bound to provide for unusual and excessive rainfall. Defendant further contended that it had acquired a prescriptive right to allow continuance of the condition without liability. Defendant maintained that an instruction of the lower court stating that when the city built the embankment and drain the law imposed a duty upon the city to keep said drain open and free from obstruction was error. The Supreme Court of Mississippi affirmed a decision for the plaintiff. A city maintaining a public street is under a duty to keep the drains under the fill in proper condition, whether or not the city constructed the fill and drain. A city must provide for such floods as may reasonable be expected, judging from such as have previously occurred, but is not liable for damages which could not have been provided for or guarded against. In the instant case the rain causing injury was not unprecedented and could have been guarded against. (Robinson-Florida)
W71-07869

HAAS V ARDOIN (LIENS CREATED FURNISHING WATER FOR CROPS).
145 So 388-390 (La Ct App 1933).

Descriptors: *Louisiana, *Water contra *Leases, *Crop production, Crops, Cultiva lands, Irrigation, Rice, Irrigated land, Water rig Legislation, Judicial decisions, Contracts, F management, Farms, Legal aspects, State juris tion, Lakes, Water supply.

Plaintiff shareholder sued defendant farmer for face value of a note executed by defendant. Pl tiff obtained a writ of sequestration, and 903 s of rice owned by the defendant were seized party who had made advances to the defendan the making of this rice crop intervened. The in vener held a warehouse receipt for the ric security for his advances. Plaintiff contended his note was in payment for rental of a lak furnish water for defendant's rice crop. Plai also claimed the statutory privilege of a person furnished water to another for the making crop. This statutory privilege gave such furnish water a privilege co-equal with the privileg those who advanced supplies for making a c The Louisiana Court of Appeal affirmed a deci for the intervener. The court held that the granting the statutory privilege relied on by p tiff required a specific agreement that the wat used for the making of a crop. The agreeme question was only for rent of a lake and land, no purpose specified. (Robinson-Florida)
W71-07871

POLLUTION STINK FOULS CITY HALL,
For primary bibliographic entry see Field 05G.
W71-07872

NAVIGABLE WATERS OF THE UNI STATES (SUPREME COURT DEFINITIONS NAVIGABILITY).
Department of the Army, Washington, D.C.

33 Code of Federal Regulations, Sec 209 (1970). 2 p.

Descriptors: *Navigable rivers, *Navigable w *Non-navigable waters, *Navigation, Judicial sions, Administration, Ownership of beds, Rip rights, Riparian waters, Rivers and Harbors Legislation, Bodies of water, Legal aspects, Fe government, Federal jurisdiction, Regulation, jurisdiction, Natural use, Obstructions to Non-uniform flow.

For informational purposes, definitions of 'n ble waters', under Supreme Court decision herein provided. Rivers used, or susceptible in their ordinary condition as highways for merce are navigable-in-fact. They com navigable waters of the United States, as op to navigable state waters, when by themselves uniting with other waters they form a cont highway for interstate or foreign commerce. capability of transportational and commercial not the extent and manner of use, afford criterion. Navigability is not destroyed by sional natural obstructions, portages, seasona or low stages of water. A river in its natural having actual navigable capacity, that is, capa carrying interstate commerce, is within the p of Congress. Navigability tests must take vari of geography, use, and traffic density into sideration. Navigation appraisals based upon ral conditions only are erroneous. 'Natural a

ry' conditions refers to water volume, ients, and flow regularity. Permissible limits on cial aids enabling commercial navigation are a er of degree. Navigability to fix bed owner- or riparian rights is determined at statehood. gability for commerce may arise later. (Earl-da)
-07880

RATION OF RESERVOIR IN INTEREST 'LOOD CONTROL.
s of Engineers, Washington, D.C.

Code of Federal Regulations, Sec 208.30 0). 1 p.

riptors: *Illinois, *Reservoir operation, *Con-, *Flood control, Dams, Reservoirs, Reservoir ge, Streamflow, Regulation, Impoundments, nels, Streams, Water levels, Runoff, Engineer-ructures, Flow control.
ifiers: *Alpine Dam and Reservoir.

he interest of flood control, the city of ford, Illinois shall operate the Alpine Dam Reservoir pursuant to this federal regulation. pening of the controlled conduit shall be one t all times, except that it shall be increased to the reservoirs after storage of flood runoff. such drainage the opening of the conduit be reset at its usual level. (Duss-Florida)
-07891

RATION AND MAINTENANCE OF RESER-R PROJECT.
s of Engineers, Washington, D.C.

Code of Federal Regulations, Sec 208.16 0). 3 p, 1 fig.

riptors: *Maryland, *Reservoir operation, ervoir storage, *Water levels, Administrative cies, Regulation, Rivers, Streams, Streamflow, control, Maintenance, Dams, Projects, nstream, Administration, Operation and main-ce.
ifiers: *Savage River Dam and Reservoir.

Upper Potomac River Commission through its voir operation supervisor shall operate the ge River Dam and Reservoir pursuant to this al regulation. The storage of the reservoir be regulated to conform with the storage vation diagram included in the regulation. ses from the reservoir shall be regulated to tain downstream flows insofar as possible n prescribed limits. The regulation prescribes tion of the reservoir in the event the reservoir exceeds a specified level during the spring of year. This regulation does not require dan-sly rapid changes in magnitudes of releases or ction which would reduce water supplies to below amounts available to them prior to ruction of the dam. The project shall be main-d according to maintenance instructions is-by the district engineer of the Corps of En-rs. The operation supervisor shall furnish re-on the dam and hydrological data to the dis-engineer. These regulations are subject to fication in time of emergency. (Duss-Florida)
-07951

RATIONS OF THE CORPS OF ENGINEERS ER THE FEDERAL POWER ACT.

Code of Federal Regulations, Sec 209.140 0). 3 p.

riptors: *Federal Power Act, *Navigation, d control, *Inter-agency cooperation, Ad-tration, Administrative agencies, Supervisory ol (Power), Administrative decisions, Naviga-. Federal jurisdiction, Coordination, In-ed control measures, Federal project policy, al reservations, Hydroelectric plants, Electric rplants, Utilities, Permits, Regulation, Naviga-ble rivers, Navigable waters, Water resource development.
Identifiers: Administrative regulations.

Under authority of the Secretary of the Army, policies and procedures applicable to Corps of Engineers operations under the Federal Power Act are herin outlined. Such operations are only to be performed upon Federal Power Commission request. Division engineers will serve the Commission as field engineer officers and will conduct field inspections and investigations. Investigation reports on FPC applications affecting navigable waters will include: (1) the desirability of a public hearing concerning navigation or flood control interests; (2) a description of factors bearing on flood control, navigation, and basin water resource development plans; (3) recommendations on license conditions deemed necessary and coordination with Corps interests; (4) advantages and disadvantages to the United States where such project is under Department of the Army jurisdiction. Such reports will not be released, nor will copies be furnished to parties, absent specific authority. The supervision of FPC licensed projects will include: (1) project classification under FPC instructions, (2) monthly inspection of major projects, and (3) postcompletion inspections. The submission of reports by division and district engineers will be governed by requirements contained herein. (Earl-Florida)
W71-07964

OPERATION AND MAINTENANCE OF FLOOD PROTECTION WORKS.
Corps of Engineers, Washington, D.C.

33 Code of Federal Regulations, Sec 208.10 (1970). 5 p.

Descriptors: *Operation and maintenance, *Flood protection, *Flood control, *Regulation, Administrative agencies, Administration, Federal government, State governments, Local governments, Construction, Levees, Engineering structures, Channels, Pumping plants, Floodways, Inspection, Hydrologic data, Drainage, Drainage systems, Rivers, Flow control, Dams, Reservoirs, Benefits, Costs, Legal aspects.

In order to obtain maximum benefits from local flood protection works constructed by the United States, this federal regulation prescribes general and specific methods of operation and maintenance of such structures and facilities. Specific structures covered include: (1) levees, (2) flood walls, (3) drainage structures, (4) closure structures, (5) pumping plants, and (6) channels and floodways. Generally, any state or local agency responsible for the operation and maintenance of flood control works shall appoint a committee headed by a 'superintendent' who shall be responsible for the project during flood periods and for continuous inspection and maintenance during periods of low water--all without cost to the United States. The regulation also prescribes the procedures to be followed in constructing further improvements within project areas. Reports shall be submitted by the superintendent to the district engineer covering inspection, maintenance, and operation of protective works. For the maintenance of specific structures, the regulations require frequent inspections and prescribe specific times when inspections should be made. Measures for maintaining the various structures are enumerated. In order to assure proper functioning and minimize damages, operation of project structures requires continuous patrol during flood periods. A final section of the regulation covers miscellaneous facilities. (Duss-Florida)
W71-07984

PORT WARDENS V MARYLAND CAPITAL YACHT CLUB (ADMINISTRATIVE DETERMINATION OF IMPAIRMENT OF NAVIGATION IN RIVER).
273 A2d 102-109 (Ct App Md 1971).

Descriptors: *Maryland, *Boat-launching ramps, *Port authorities, *Administrative decisions, Boats, Navigation, Administrative agencies, Local governments, Permits, Regulation, Legal aspects, Construction, Engineering structures, Riparian rights, Rivers, Bulkheads, Piers, Docks, Breakwaters, Dredging, Channel improvement, Environment engineering, Judicial decisions.

Plaintiff yacht club sought declaratory relief from defendant port warden's denial of permission to build boat slips and related structures and to conduct dredge and fill operations in a river. Plaintiff also sought to have the mayor and aldermen's affirmation of the denial declared void. Plaintiff contended that the port wardens could not deny a permit unless they found that navigation would be impaired. Plaintiff also contended that the mayor and aldermen were limited to reviewing the record of the hearing and could not conduct a hearing de novo. Defendant contended that the construction of all of the proposed slips would render navigation too close and confined. The Court of Appeals of Maryland affirmed the trial court's granting of the relief sought and reviewed the evidence in the case. The testimony of witnesses at the port warden's hearing clearly indicated that plaintiff's proposed operation would not interfere substantially with navigation. A court may overturn an agency's finding of fact where that finding is deemed to be arbitrary, unreasonable, and capricious. Although additional evidence may have been introduced at the mayor and aldermen's hearing, they had no authority to conduct a de novo hearing. (Smiljanich-Florida)
W71-07987

BOWLEY V OMAHA AIRPORT AUTHORITY (CONDEMNATION VALUE OF LANDS SUBJECT TO FLOODS).
182 NW2d 911-915 (Neb 1971).

Descriptors: *Nebraska, *Condemnation value, *Floodways, *Land appraisal, Eminent domain, Condemnation, Flood proofing, Flood plain zoning, Levees, Flood protection, Water districts, Flood plains, Missouri River, Channels, Flood control, Land use, Compensation, Industries, Recreation, Rivers, State governments, Administrative agencies, Judicial decisions, Legal aspects, Floods.

Plaintiff landowner sought by eminent domain proceedings to appraise the value of land to be condemned by defendant agency. Plaintiff contended that the land was suitable for industrial purposes and that, although the land was situated in the flood channel of the Missouri River, a levee could be constructed to prevent floods. Plaintiff also contended that he could force the creation of a levee district to construct such a levee. Defendant contended that the land was suitable only for recreational use and sand mining. In affirming a verdict and judgment for defendant's requested valuation, the Supreme Court of Nebraska noted that the land was vulnerable to floods, had poor access to river traffic, and was not in an industrial area. Moreover, evidence was insufficient to show that a new levee would adequately protect plaintiff's land from floods. As to the creation of a levee district, it appeared that many landowners might be affected by such a levee. In addition to the approval of the county board, it would be necessary to obtain a permit under the Flood Plain Act. (Smiljanich-Florida)
W71-07988

DURSO V STATE (CONDEMNATION OF PORTION OF LANDOWNER'S SEWAGE SYSTEM).
318 NYS2d 791-793 (App Div 1971).

Descriptors: *New York, *Cesspools, *Condemnation value, *Damages, Eminent domain, Condemnation, Land tenure, Sewage treatment, Sewage disposal, Waste treatment, Domestic wastes, Leaching, Gravity, Sewers, Boundaries (Property), State governments, Damages, Highway relocation, Judicial decisions, Legal aspects.

Action was brought by plaintiff restaurant owner to recover damages for appropriation of land by defendant state. Plaintiff contended that the condemnation of land by the state included portions of his gravity-type sewage system and that an allowance of $600 damage by the lower court was inadequate. Defendant contended that only one cesspool of plaintiff's sewage system was appropriated and that the damages awarded were reasonable. In modifying the judgment of the Court of Claims, the Supreme Court of New York, Appellate Division, Third Department, noted that the taking of the condemned land removed one of plaintiff's cesspools and cut across the tile leach lines which led to a substantial dispersal area. Plaintiff's gravity-type sewage system was thus rendered useless. Plaintiff was not entitled to damages for installation of a complicated and sophisticated sewage system, however, but was awarded $5000 in damages to replace the previous sewer system. (Smiljanich-Florida)
W71-07989

ACT REQUIRING BONDS AS SECURITY FOR DAMAGE TO PUBLIC LANDS BY DRILLING AND MINING.
Florida Laws, ch 69-367, p 1293 (1969).

Descriptors: *Florida, *Public lands, *Drilling, *Mining, State jurisdiction, Damages, Legislation, Oil industry, Mineral industry, Leases, Oil, Gases, Sulfur, Air pollution, Water pollution, Wildlife conservation, Marine animals, Public health, Legal aspects, Administrative decisions, Administrative agencies.

The Trustees of the Internal Improvement Trust Fund shall require a surety or property bond from lessees intending to drill or mine on public lands. The bond shall serve as security and is to be forfeited to the Trustees to pay for any damages caused by the mining or drilling operations. If the drilling or mining will be conducted in the waters of the state, the Trustees shall give special consideration to the extent of such possible damages, including air and water pollution, and destruction of wildlife or marine productivity. (Smiljanich-Florida)
W71-08005

SPECIFICITY REQUIRED IN MINERAL LEASES GRANTED BY STATE AGENCIES.
Florida Laws, Ch 69-239, p 942-943 (1969) amending Fla Stat Sec 253.45.

Descriptors: *Florida, *Leases, *Mining, *Administrative agencies, State jurisdiction, Water contracts, Phosphates, Soils, Sands, Clays, Gravels, Lumber, Beaches, Recreation, Drilling, Legislation, Legal aspects.

The trustees of the Internal Improvement Trust Fund, and any other administrative agency having title to or control over any state owned lands, may sell or lease any water, phosphate, soils, timber or minerals in any of the lands other than hard-surfaced beaches used for recreation and certain areas contiguous thereto. The state agencies authorized to grant leases shall specify in each lease the particular minerals the lessee is permitted to drill or mine and the manner in which the same may be extracted. (Smiljanich-Florida)
W71-08028

ACT REQUIRING CONSERVATION REPORTS PRIOR TO WORK ON SUBMERGED LANDS.
Florida Laws, Ch 69-337, amending Fla Stat Sec 253.1241, p1171-1172 (1969).

Descriptors: *Florida, *Beds under water, *Surveys, *Permits, Dredging, Landfills, Bulkhead line, Submergence, Ownership of beds, Regulation, Investigations, Administrative agencies, Legislation, Legal aspects.

Relating to the regulation of submerged lands and amending a prior act, this legislation requires that certain conservation reports be requested by the Trustees of the Internal Improvement Trust Fund. The Trustees shall request the studies and surveys from the state board of conservation within thirty days after the receipt of an application for sale of submerged land, setting of a bulkhead line or a dredge or fill permit. (Smiljanich-Florida)
W71-08034

ACT PROVIDING FOR THREE YEAR EXPIRATION DATE ON FILL PERMITS.
Florida Laws, Ch 69-336, amending Fla Stat Sec 253.124 (4) p 1170-1171 1969.

Descriptors: *Florida, *Landfills, *Permits, *Beds under water, Operations, Regulation, Environmental engineering, Public lands, Administrative decisions, Administrative agencies, Legislation, Adjudication procedure, State jurisdiction, Legal aspects.
Identifiers: Expiration dates.

Amending and clarifying an existing act, this legislation provides that a fill permit, which shall be issued by the Trustees of the Internal Improvement Fund only if the proposed work is to be completed within three years, shall expire three years after the issuance of the fill permit. Such time may be extended for additional periods of up to three years by the Trustees for good cause, upon a showing that all due efforts and diligence toward completion of the work have been made. Provision is made for revocation of permits for non-compliance or violation of their terms. Judicial review of such revocation is also provided (Smiljanich-Florida)
W71-08040

TITLE TO SUBMERGED LANDS AND RESTRICTIONS ON BULKHEAD LINES AND FILLING AND DREDGING.

Florida Laws, Ch 69-308, amending Fla Stat Sec 253.12 (1), p 1112 (1969).

Descriptors: *Florida, *State jurisdiction, *Dredging, *Ownership of beds, Beds under water, Land tenure, Islands, Sand bars, Banks, Federal government, Landfills, Coasts, Navigable waters, Lakes, Navigable rivers, Streams, Bulkhead line, Permits, Administrative agencies, Legislation, Legal aspects.

The Trustees of the Internal Improvement Trust Fund are vested with title to all sovereignty submerged lands, including: (1) all islands, sand bars, shallow banks and small islands made by the dredging of any channel by the United States government; (2) sand bars and shallow banks located in the navigable waters; (3) all coastal and intracoastal waters of the state; and (4) all submerged lands owned by the state by right of its sovereignty in navigable freshwater lakes, rivers and streams, except submerged lands conveyed by prior deed or statute. Submerged land in navigable freshwater lakes, rivers and streams are hereby included within restrictions relating to bulkhead lines and filling and dredging of submerged lands. (Smiljanich-Florida)
W71-08041

LOUISIANA SOUTHERN RY V BOARD OF LEVEE COMM'RS (LIABILITY OF STATE FOR FLOODING OF LANDS BY LEVEE).
176 La 687, 146 So 470-472 (1933).

Descriptors: *Louisiana, *Levees, *Flooding, *Damages, Flood damage, Submergence, Floodwater, State jurisdiction, Flood control, Compensation, Net income, Profit, Land use, Government finance, Legislation, Judicial decisions, Legal aspects, Administrative decisions, Remedies.

Plaintiff railway sued defendant board of levee commissioners for loss of revenue due to flooding of plaintiff's lands. The flooding was caused by an artificial break in defendant's levee. Plaintiff contended that defendant had assumed liability for the intentional act and therefore should pay for los plaintiff's revenue while its lands were covered w water. Defendant contended that the stat authorizing payment of damages limited s damages to the injury to physical property. In firming a dismissal of the suit by the lower co the Supreme Court of Louisiana noted that state has the right of determining the propriety, cation, and mode of building levees. Whate damages are caused to others in the exercise of right are non-compensable without voluntary sumption of liability. Defendant had accepted bility limited to physical damages, and plaintiff therefore not allowed to recover for consequer injuries. (Smiljanich-Florida)
W71-08054

PALMER CORPORATION V COLLINS (C TAMINATION OF OIL BY WATER SEEPA FROM NEGLIGENTLY ABANDONED WELL).
214 Ky 838, 284 SW 95-98 (1926).

Descriptors: *Kentucky, *Oil wells, *Groundw *Seepage, Drill holes, Oily water, Groundw movement, Oil-water interfaces, Impervious Groundwater barriers, Infiltration, Oil, Oil r voirs, Drilling equipment, Leases, Damages, tenure, Judicial decisions, Legislation, aspects.

Plaintiff leaseholder sued defendant corpor for damages caused by defendant's failur adequately plug up abandoned oil wells. Pla contended that the abandoned wells allowed to seep into the oil-bearing stratum, thus taminating plaintiff's oil with water. Defen contended that plaintiff had not sufficiently pr that the water came from defendant's aband wells. Defendant also contended that a st authorizing plaintiff to go on defendant's lan plug up the wells and then maintain an a against defendant to recover the cost preclude plaintiff from additionally seeking damages oil. The Court of Appeals of Kentucky, in affi the lower court judgment for plaintiff, noted water had not appeared in plaintiff's oil until d dant's wells were abandoned and subsequ found to contain water. The statute autho plaintiff to prevent future damages did preclude his right to recover for the past inju curred by the water. To destroy the producti oil is to destroy property, allowing the own recover damages thereby sustained. (Smilja Florida)
W71-08055

GIBSON V MADDEN (BOUNDARY DIS REGARDING MEANDER OF STREAM ADVERSE POSSESSION).
229 Ky 273, 17 SW2d 263-266 (1929).

Descriptors: *Kentucky, *Boundary disputes eanders, *Prescriptive rights, Boundaries (P ty), Streams, Riparian lands, Land tenure, W courses (Legal), Riparian rights, Banks, Ju decisions, Remedies, Thalweg, Channels, aspects.
Identifiers: *Adverse possession.

Plaintiff brought action against defendant to title to a disputed strip of land. Plaintiff cont that a boundary line described in a deed as drawn 'up the creek' meant that the bounda followed the center of the creek with its mea Plaintiff alternatively contended that he h tained title to the land through adverse poss Defendant contended that the disputed bou line was meant to be a straight line not fol the thread of the stream and that he had plaintiff permission to use the land in questio precluding adverse possession. The Court peals of Kentucky, affirming a judgment for dant, noted that the context of the deed in that a straight line was the true boundary property. The defendant, therefore, had titl land and had given his permission for plai

he land. No prescriptive title to a contested of land is established through use where such is with the owner's permission. (Smiljanich-da)
-08057

MIT V SERGEANT BLUFF CONSOL INDE-DENT SCHOOL DIST (DUTY TO PROVIDE OOL TRANSPORTATION DESPITE AVUL-N OF RIVER).

NW 636-637 (Iowa 1935).

riptors: *Iowa, *Avulsion, *Schools (Educa-, *Boundaries (Property), Missouri River, dary disputes, Transportation, Reimbursable , Contracts, Rivers, Administrative agencies, governments, State jurisdiction, Legislation, ial decisions, Legal aspects.

tiff landowner sued defendant school district ne cost of transporting his children to school. tiff contended that a shift in the Missouri caused plaintiff's lands to be on the opposite of the river but still within the state. Plaintiff contended that defendant agreed to pay tuition laintiff's children to attend school in the boring state but thereafter refused to pay for ransportation to such school. Defendant con-d that it was not required to provide transpor-n to schools in another state as it had not en-into a contract with plaintiff to do so. In af-ng the trial court award to plaintiff for the cost nsporting his children, the Supreme Court of noted that the avulsion of a river does not state boundaries. As plaintiff's lands were still n the state, the school district was obligated by te to provide school transportation for his chil-The agreement to send the children to the boring state's schools carried with it the duty e school district to pay for the transportation ved. (Smiljanich-Florida)
-08075

THRUP V CITY OF JACKSON (ABATE-T OF MUNICIPAL WASTE POLLUTION DAMAGES).
Mich 20, 262 NW 641-644 (1935).

riptors: *Michigan, *Municipal wastes, ter pollution, *Remedies, Rivers, Cities, rian land, Riparian rights, Reasonable use, ages, Sewage disposal, Waste dumps, Sewage ment, Pollution abatement, Treatment facili-Water pollution effects, Relative rights, rian waters, Local governments, Legislation, ial decisions, Legal aspects.
ifiers: *Nuisance.

tiff riparian landowner sued defendant city ng damages and an injunction. Plaintiff con-d that defendant's raw sewage was emptied river bounding plaintiff's land, thus polluting ver and creating a nuisance. Plaintiff also con-d that defendant's sewage system was not a rnmental function but was a private or rictary function. Defendant contended that a sion in the city charter required plaintiff to nt his claim to the city as a prior condition to ing suit, which the plaintiff had failed to do. In ning the injunction granted by the lower court reversing an award for past damages, the me Court of Michigan held that the charter sion requiring prior presentment of claims to ity was valid as applied to damages incidental atement of a nuisance. The court noted that a ge system is a necessary city function which is c in character and therefore a governmental ise protected by charter provisions. (Smil-h-Florida)
-08079

TE EX REL BUCKSON V PENNSYLVANIA DETERMINATIONS BY PRIOR SURVEYS OCATION OF MEAN LOW WATERLINE).

A2d 268-271 (Del 1971).

Descriptors: *Delaware, *Low water mark, *Boundaries (Property), *Landfills, Water level fluctuations, Riparian rights, Delaware River, Boundary disputes, Geological surveys, State governments, Railroads, Core drilling, Rivers, Banks, Water levels, Average, Measurement, Variability, Riparian land, Judicial decisions, Legal aspects, High water mark.

Plaintiff attorney general sought a declaratory judgment to determine title and related rights to certain foreshore between high and low water marks on a river. Plaintiff contended that defendant's filling operation extended beyond the mean low waterline. Plaintiff also contended that surveys made in 1942 and 1954 as to location of the mean low waterline were adequate in determining its location in 1964, when the filling operation was commenced. Plaintiff alternatively requested that the case be remanded to permit the state to make geological examinations of core drillings in order to establish the natural mean low waterline. Defendant contended that surveys made in 1967, after the filling operation ceased, were the only adequate evidence as to the location of the mean low waterline. In affirming the lower court judgment for defendant, the Supreme Court of Delaware noted that the surveys taken in 1942 and 1954 were inadequate to accurately demarcate the mean low waterline of 1964. The state's request for a new determination, made five years after the commencement of the action, was not timely and therefore rejected. The survey of 1967 was the only adequate evidence as to the waterline's location. (Smiljanich-Florida)
W71-08113

NEW RIVERS AND OLD REALITIES: WHY WESTERNERS DISAGREE ABOUT SHARING THEIR WATER WEALTH,
Department of Environment, Ottawa (Ontario). Prairie Region Water Planning.
Frank J. Quinn.
Arizona Review, Vol 20, No 4, Apr 1971. 9 p.

Descriptors: *Inter-basin transfers, *Arid lands, *Planning, *Beneficial use, Environmental effects, Evaluation, Political aspects, Legal aspects, Social aspects, Water resources development, Surface waters, Rivers, Canada, Southwest U.S., Pacific Northwest U.S.

This is a discussion of manipulation of water resources for interbasin transfer. The Southwest contends with an imbalance between growing population and dwindling water resources. Obvious solutions such as reallocation of existing water rights to guarantee beneficial use and recycling require complicated political maneuvering which is often unsuccessful. In fact, no man-made water diversions now cross major political boundaries. In the past, surplus parts of a basin have supplemented deficit parts of the same basin. Water is different from other resources, often coming free with property, and is allocated by differing state governments. One user may affect many other users. Some current thoughts on interbasin transfer follow: Water transfers on a large scale of necessity would create large-scale environmental disturbances. Efficiency based arguments state that water should go to the highest bidder, or where it is most valuable. Equitable-sharing proponents use the amount of so-called 'progress' or social benefits gained, to evaluate systems of water use. Environmental thinkers advocate comprehensive planning and thorough preliminary studies before interbasin transfer is to be attempted. The problem must be viewed as a national, rather than a regional struggle. (Yensen-Arizona)
W71-08145

RIVER BASIN MONETARY AUTHORIZATION AND MISCELLANEOUS CIVIL WORKS AMENDMENTS ACT OF 1970.
Public Law No 91-282, 84 Stat 310, 6 US Code Cong and Admin News, p 1837-1840 (1970). 4 p.

Descriptors: *River basin development, *Government finance, *Project planning, *Projects, Legislation, River basins, Flood control, Planning, Water resources development, Financing, Budgeting, Allotments, Federal government, Water supply, Water storage, Water management (Applied), National parks, Dams, Hydroelectric plants, Reservoirs, Water rights, Pumped storage, Barriers, Fish hatcheries, Legal aspects.

Pursuant to previous acts authorizing various public water projects, Congress herein authorizes additional appropriations for prosecution of these projects. The projects so affected include: various comprehensive river basin plans; and the central and southern Florida comprehensive plan for flood control, including water supply requirements for the Everglades National Park. Congress also modifies various other public water projects to include: (1) the construction of local protection works in a flood control project in Ohio; (2) authorization to include the construction of a pumped storage development in the comprehensive development plan of the Delaware River Basin; (3) the construction, operation, and maintenance of fish hatchery facilities in Montana; and (4) authorization for a city to construct a barrier dam across a lake in Texas, provided that the city obtain any necessary state water rights. (Smiljanich-Florida)
W71-08157

INTERNATIONAL, NATIONAL AND STATE ELEMENTS OF OCEANS AND COASTAL ZONE MANAGEMENT,
California Advisory Commission on Marine and Coastal Resources.
Robert B. Brueger.
Oceans 71 Conference, Mar 11, 1971, Long Beach, California. 17 p.

Descriptors: *Oceans, *Water management, *Water policy, *Water resources development, *Legislation, International waters, International law, Coasts, Seas, Regulation, Planning, Political aspects, State governments, Federal government, California.
Identifiers: Global oceans management.

Oceans management is a global issue, with state, national and international policies having global effects. Five essential guidelines for a global oceans management system are presented, with emphasis on concomitant political realism. International progress is being made, as demonstrated by the establishment of the U.N. Seabeds Committee, a 1973 U.N. Conference on ocean issues, and a 1972 U.N. Conference on the Human Environment. U.S. federal regulation and policy development for ocean management is explored with references to the River and Harbors Act of 1899, the Refuse Act of 1899, the 1953 Outer Continental Shelf Lands Act, the National Environmental Policy Act of 1969, and the proposed National Coastal and Estuarine Zone Management Act of 1971. Lack of state regulation and policy of coastal uses is discussed. The development of the California coastal zone management system is presented in detail, with a discussion of several conservation acts and commissions, and emphasis on the proposed establishment of a state-wide coastline regulatory scheme. (McEntyre-PAI)
W71-08158

AN ACT PROVIDING A SETBACK LINE FOR COASTAL CONSTRUCTION AND EXCAVATION; THE GRANTING OF VARIANCES, AND PENALTIES.

Florida Laws, Ch 70-231, p 674-677 (1970) amending Fla Stat Ch 161.

Descriptors: *Florida, *Beach erosion, *Erosion control, *Coastal structures, Non-structural alternatives, Legislation, Legal aspects, Coastal engineering, Excavations, Sea walls, Shore protection, Specifications, Supervisory control (Power), Constraints, Adoption of practices, Real property,

Riparian land, Beaches, Administration, Administrative decisions, State governments, Construction, Administrative agencies, Washouts.

No person, firm, corporation, or public agency shall construct any dwelling, hotel, motel, apartment, sea wall, revetment, or incidental or related structures within fifty feet of the mean high water line of riparian coastal locations. This amendment to existing legislation encompasses the Gulf of Mexico and Atlantic shorelines exclusive of bays, inlets, rivers, bayous, creeks, and passes. Setback waiver or variance may be authorized by the Department of Natural Resources: (1) upon facts clearly justifying waiver on variance; (2) if existing structures have established a reasonably continuous, closer construction line not affected by erosion; and (3) for the construction of non-eroding pipelines and piers. Structures or excavations violating this section are hereby declared a public nuisance. The Department of Natural Resources may remove such nuisance after failure to comply with written notice. All costs shall constitute a lien upon the property. Each month of violation shall constitute a separate offense punishable by not less than $500, nor more than $1000. This section shall not apply to existing structures, structures under construction, or shore protection structures. The Department may specifically exempt coastline areas not subject to substantial erosion. (Earl-Florida)
W71-08174

INTERNAL IMPROVEMENT TRUST FUND (TRUSTEES GIVEN POWER OF EMINENT DOMAIN OVER SUBMERGED LANDS).
Florida Laws Ch 70-358, p 1139 (1970) amending Fla Stat Sec 253.02. 1 p.

Descriptors: *Florida, *Eminent domain, *Beds under water, *Administrative agencies, Beds, Legislation, Condemnation, Land, Land tenure, Navigable waters, Legal aspects.

Amending portions of existing Florida statutes relating to the Board of Trustees of the Internal Improvement Trust Fund, this act provides the Board with the power of eminent domain over submerged lands. Certain lands are excluded from this power. The Board shall be a necessary party in eminent domain proceedings involving submerged lands and lands under navigable waters. (Duss-Florida)
W71-08177

AN ACT RELATING TO THE BOARD OF TRUSTEES OF THE INTERNAL IMPROVEMENT FUND, PROHIBITING THE ISSUANCE OF AFTER-THE-FACT CONSTRUCTION PERMITS.
Florida Laws ch 70-116, p 429-430 (1970) amending Fla Stat sec 253.124.

Descriptors: *Florida, *Administrative decisions, *Permits, *Landfills, Land development, Land use, Administration, Adoption of practices, Administrative agencies, Environmental effects, Conservation, Real property, Supervisory control (Power), Environment, Constraints, Legislation, Legal aspects, Marine plants, Coastal engineering, State governments.

The Board of Trustees of the Florida Internal Improvement Fund shall in no case issue after-the-fact construction permits for the filling of land. Upon consideration of a report by the Department of Natural Resources, however, such a permit may be granted where the Board finds that any other remedy available to it would be more damaging to the environment or marine resources. The granting of such permits shall not absolve applicants from the provisions of subsection five of this section. (Early-Florida)
W71-08200

INTERNAL IMPROVEMENT TRUST FUND (AMENDMENT TO LAW RELATING TO DREDGING AND FILLING).
Florida Laws ch 70-167, p 540-542 (1970) amending Fla Stat sec 253.123. 3 p.

Descriptors: *Florida, *Dredging, *Navigable waters, *Bulkheads, Legislation, Pumping, Navigation, Channels, Beach erosion, Sands, Administrative agencies, Administration, Landfills, Legal aspects, Beaches, Shores.
Identifiers: *Bulkhead lines.

Amending existing Florida statutes relating to restrictions on filling land and dredging beyond bulkhead lines, this act provides two things. First, it extends existing restrictions on the removal of material from certain navigable waters to apply to waters landward as well as channelward of bulkhead lines. Secondly, the act eliminates an exception to the general prohibition against removal of sand, rock or earth from navigable waters by dredging, pumping, digging or other means. Specifically, no longer will such removal be permitted for the replenishment of eroded beaches or for the prevention or reduction of beach erosion. (Duss-Florida)
W71-08201

INTERNAL IMPROVEMENT TRUST FUND (PERMITS RELATING TO THE FILLING OF LAND).

Florida Laws Ch 70-333, p 973-974 (1970) amending Fla Stat Sec 253.124.

Descriptors: *Florida, *Permits, *Coastal structures, *Riparian land, Navigable waters, Bulkheads, Sea walls, Shore protection, Retaining walls, Erosion, Avulsion, Administrative agencies, Administration, Legislation, High water mark, Construction, Ecology.

Amending an existing Florida statute relating to the filling of land, this act requires riparian upland owners bordering navigable waters to obtain a permit before rebuilding, replacing, repairing or reconstructing certain coastal structures. Coastal structures covered include seawalls, retaining walls, revetments, bulkheads or other similar structures. Permits shall be issued by the authorized local or county body. Permits are subject to the approval of the Board of Trustees of the Internal Improvement Trust Fund and are not valid without approval. The Act outlines circumstances under which riparian owners may be exempt from submitting biological and ecological studies concerning the effects of their proposed work. (Duss-Florida)
W71-08202

FLORIDA AIR AND WATER POLLUTION CONTROL ACT (ASSESSMENT OF DAMAGES TO FISH POPULATIONS).
Florida Laws Ch 70-141, p 488 (1970) amending Fla Stat Sec 403.141.

Descriptors: *Florida, *Water pollution control, *Damages, *Fishkill, Water pollution, Conservation, Fish, Administrative agencies, Regulation, Wastes, Fish populations, Legislation, Ecology, Aquatic environment, Administration, Standards.

Amending an existing Florida statute relating to assessment of damages against polluters whose discharges into waters damage fish populations, this act provides that a table of values for individual categories of fish shall be utilized in assessing such damages. The Department of Air and Water Pollution Control shall promulgate such table of values and shall utilize existing values established by the Department of Natural Resources and the Game and Fresh Water Fish Commission. (Duss-Florida)
W71-08203

LEGAL ASPECTS PERTAINING TO ENVIRON MENTAL REGULATIONS IN PORK PRODUC TION,
Missouri Univ., Columbia. Dept. of Agricultur Economics.
For primary bibliographic entry see Field 05G.
W71-08210

THE REFUSE ACT OF 1899: NEW TASKS FO AN OLD LAW,
William C. Steffin.
Hastings Law Journal, Vol 22, No 3, p 782-80 (1971). 23 p, 156 ref.

Descriptors: *Rivers and Harbors Act, *Water po lution control, *Pollution abatement, *Was disposal, Legislation, Non-structural alternative Permits, Judicial decisions, Federal governmen Federal jurisdiction, Water quality control, Wat pollution, Water pollution sources, Effluents, I dustrial wastes, Administration, Legal aspect Navigable waters, Administrative agencies, Supe visory control (Power), Regulation, Adjudicati procedure.

Known as the Refuse Act, Section 13 of the Rive and Harbors Act of 1899 prohibits the discharge refuse into navigable waters without a permit. Th note considers utilization of the Refuse Act a water pollution control device. Contempora abatement devices, because of restrictive judici doctrines or ineffective statutory enforceme procedures, are inadequate. In the author's vie the Refuse Act overcomes a number of existi abatement barriers. Broad judicial interpretati and the Act's recently implemented discharge-pe mit system make it applicable to most water poll tion violations. Enforcement procedures under t Act are detailed. The Justice Departmen reluctance to exercise its enforcement authority analyzed and critized. Injunctive relief and crimin sanctions are available under the Act. The pos bility of extending injunctive relief to futu discharges and the removal of past discharges discussed. The nature and utilization of qui tam a tions is examined. The effectiveness of enforc ment procedures on a class of pollutors is co sidered in terms of specific case histories. T author concludes that the Act is a valuable poll tion control tool which could become more valu ble with an effectively administered permit syste (Earl-Florida)
W71-08228

THE LEGAL STATUS OF ARTICLES 1-3 THE CONTINENTAL SHELF CONVENTIO ACCORDING TO THE NORTH SEA CASES,
Myron Nordquist.
California Western International Law Journal, V 1, No 1, p 60-79 (1970). 20 p, 81 ref.

Descriptors: *International law, *Continen Shelf, *Beds under water, *Regime, United N tions, Judicial decisions, Treaties, Internatio waters, Boundary disputes, Legal aspects, Jurisd tion, International commissions, Foreign countri Law of the sea, Beds, Political aspects, Exploi tion, Administration.

As interpreted in the North Sea Continental Sh Cases, the status of Articles 1-3 of the Continen Shelf Convention is evaluated in this article and lated to present attempts to regulate internatio sea-bed areas. The principles and rules of law forth in the North Sea Cases are reviewed by author. Although the customary law status of A cles 1-3 were not ruled upon in the North S Cases, the author scrutinizes both the majority a dissenting opinions for indications of that stat After focusing particular attention upon Arti One, the author concludes that Articles 1-3 wo be integral components of any Continental Sh regime. The view that these articles are custom law is supported by state practice patterned af these articles. If Articles 1-3 are in fact custom law, their effect upon newly negotiated treat must be carefully weighed. Rights obtained un

xploitation clause of Article One would con-
with the Draft Convention on the International
Bed Area submitted by the United States. For-
tely, no perfected exploitation claims exist,
there is still time to rationally develop a sea-
regime. Accelerated technological advances,
ever, indicate the time for rational develop-
may be running out. (Earl-Florida)
-08229

HIGAN ENVIRONMENTAL PROTECTION
OF 1970,
n Pearce.
al of Law Reform, Vol 4, No 1, p 121-134
0). 14 p, 66 ref.

riptors: *Michigan, *Water quality control,
ter pollution control, *Environmental effects,
tion abatement, Legislation, Water policy, Ju-
decisions, Legal aspects, Adjudication
edure, Public rights, Water quality, Water
rces, State governments, State jurisdiction,
structural alternatives, Balance of nature,
edies, Relative rights, Social values.
ifiers: *Michigan Environmental Protection
f 1970.

substance, common-law roots, and potential
ioning of the Michigan Environmental Protec-
Act are examined in this note. The Act ex-
ly recognizes and expands a legal interest in
onmental protection, enforceable through
or private litigation. A procedural framework
ablished for the assertion of this right in judi-
roceedings. The author evaluates the Act in
of: (1) the legal basis for the environmental
afforded, (2) review of administrative
edings., (3) the Act's lack of judicial stan-
, (4) the variety of actions and remedies
ble under the Act, and (5) the protection af-
d indigents. Constitutional questions arising
the Act are examined. The direct judicial con-
ation of environmental issues allowed by the
removal of barriers to private environmental
ns are evaluated. Implicit recognition that en-
mental protection requires a balancing of
eting interests is contained in the Act's
y of enforcement actions. The absence of
tary awards may be only partially cured by
rovision authorizing class actions. Although a
d alternative to prior legislative and adminis-
e remedies is provided, the Act's flexibility
s its potential effectiveness difficult to pre-
Early cases must be well defined to insure the
ly development of judicial standards. (Earl-
la)
08230

UENT CHARGES: WATER POLLUTION
TROL,
nna M. Longo.
al of Law Reform, Vol 4, No 1, p 47-62
). 16 p, 67 ref.

riptors: *Water pollution control, *Water
y control, *Economic justification, *Cost al-
on, Effluents, Real costs, Total costs, Water
, State governments, Federal government,
governments, Legislation, Non-structural al-
tives, Pollution abatement, Water pollution,
onmental sanitation, Administration, Ad-
trative agencies, Judicial decisions, Legal
ts, Water users, Economics, Feasibility stu-
Resource allocation, Waste disposal.
fiers: *Water Quality Act of 1965, Effluent-
e systems.

gnizing the gravity of the national water-pollu-
roblem, this note examines the necessity and
tutionality of effluent charge systems. In the
r's view, water pollution exists because water
underpriced commodity. Under an effluent-
e system the total cost of each unit of water,
ling pollution costs, are assigned to each user.
r quality standards promulgated under the
r Quality Act of 1965 have failed to encom-
he total-cost concept. Institutional arrange-
ments for administration effluent charges are compared at the federal, state, and local level. In the author's view, practical and political problems dictate that effluent systems be administered at the state level. The constitutionality of state-administered effluent charges are analyzed in relation to: (1) prohibitions against special commissions, (2) municipal home rule provisions, and (3) indebtedness limitations. To successfully implement an effluent-charge system, the author concludes that each state should adopt legislation: (1) vesting in the state ownership or control of all public water resource facilities; (2) establishing an agency with comprehensive water planning, development, and management authority; and (3) allowing actions by private attorneys general against such an agency. (Earl-Florida)
W71-08231

THERMAL POLLUTION: THE ELECTRICAL UTILITY INDUSTRY AND SECTION 21 (b) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
Russell L. Johnson.
Hastings Law Journal, Vol 22, No 3, p 685-704 (1971). 20 p, 160 ref.

Descriptors: *Thermal pollution, *Electric power industry, *Water quality control, *Water pollution control, Federal government, Legislation, Legal aspects, Judicial decision, Pollution sources, Electric powerplants, Thermal water, Water pollution, Nuclear powerplants, Pollution abatement, Temperature, Environmental effects, Administration, Adoption of practices, Administrative agencies, Administrative decisions, State governments, Cooling waters, Thermal conductivity, Ecology, Supervisory control (Power).
Identifiers: *Federal Water Pollution Control Act, *Water Quality Improvement Act of 1970.

The Water Quality Improvement Act of 1970 (WQIA) was enacted to control thermal pollution by electric utilities. Evaluated in this note is the Act's impact in relation to the environmental problems created by thermal pollution. Water quality standards and enforcement procedures under the Federal Water Pollution Control Act (FWPCA) have not adequately protected the aquatic environment from nuclear and fossil fuel generating plants. A case study is utilized by the author to demonstrate that the FWPCA does not allow preventative regulation of thermal pollution. Section 21 (b) of the WQIA was intended to fill this regulatory gap. The act requires certification to the appropriate federal agency that existing water quality standards will not be violated. WQIA certification procedures, compliance checks, and licensing agency jurisdiction are evaluated. The substantive weaknesses of Section 21 (b) are evaluated. Such weaknesses include: (1) the absence of public hearings, (2) inadequate regulation of fossil-fuel plants, and (3) the inadequacy of related water quality standards. Despite such weaknesses the WQIA is a major step in the preventative control of thermal pollution. (Earl-Florida)
W71-08232

THE NORTH SEA CONTINENTAL SHELF CASES--A RAY OF HOPE FOR THE INTERNATIONAL COURT,
L. F. E. Goldie.
New York Law Forum, Vol 16, No 2, p 325-377 (1970). 53 p, 189 ref.

Descriptors: *International law, *Continental Shelf, *Judicial decisions, *International commissions, Boundary disputes, Boundaries (Property), United Nations, Jurisdiction, Foreign countries, Foreign waters, Beds under water, Regime, Regulation, Administration, Treaties, Political aspects, Law of the sea, International waters, Oil industry, Legal aspects, Exploitation.

The North Sea Continental Shelf Cases are evaluated in this article in relation to their effect upon the role of the International Court of Justice. The Court's holding in these cases, based in part upon the Continental Shelf Convention and in part upon an international 'duty to negotiate' over lapping continental shelves, is examined in terms of: (1) the facts of the dispute, (2) arguments presented, (3) equity and distributive justice principles, and (4) the 'natural prolongation doctrine' and equidistance principle. The author relates customary international law on the Continental Shelf to: (1) the formation and formative organs of international law, (2) proposed principles of international common law, and (3) the court's view of the customary law status of the Continental Shelf Doctrine. The source, significance, and development of the international obligation to bargain in good faith are considered, along with objections thereto. Alternative Continental Shelf regimes are discussed in light of: (1) goals, (2) areas, (3) participants, and (4) measures. The agent state model administrative conciliation, and multi-national public enterprises are considered as alternative regimes. The author concludes that the North Sea decision may afford a means of restoring the court to a central position in the international legal order. (Earl-Florida)
W71-08233

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO CHANGE THE TREATMENT WORKS CONSTRUCTION PROGRAM.
Senate Bill 1092, 89th Cong, 1st Sess (1965).

Descriptors: *Water pollution treatment, *Treatment facilities, *Construction costs, *Grants, Allotments, Financing, Projects, Administration, Project planning, Water pollution control, Pollution abatement, Water quality control, Cost allocation, Administrative agencies, Government finance, Federal government, Human population, Urbanization, Cities, State governments, Legislation, Legal aspects.

Provisions of the Federal Water Pollution Control Act regarding treatment works construction programs would be amended by this bill to delineate the limitations on federal grants and to allot federal sums appropriated pursuant to the Act. No federal grant would be made for any project under the Act unless such project shall have been approved by the appropriate state water pollution control agency and by the Secretary, and unless such project is included in a comprehensive program developed pursuant to the Act. Such grants would not exceed 30 per centum of the estimated reasonable cost of the treatment works. The projects must be in conformity with the state water pollution control plan and must satisfactorily assure proper and efficient operation and maintenance of the treatment works. Sums appropriated pursuant to the Act would be allotted both on the basis of the total state population and on the basis of the state urban population. Any state failing to use allocated funds for lack of projects would, subject to certain restrictions, have those funds reallocated to other states. (Smiljanich-Florida)
W71-08234

MARINE EXPLORATION AND DEVELOPMENT ACT.
Senate Bill 1091, 89th Cong, 1st Sess (1965).

Descriptors: *Continental Shelf, *Water resources development, *Exploitation, *Exploration, Mining engineering, Oceans, Water resources, Marine geology, Beds, International waters, International law, Treaties, Federal jurisdiction, Coasts, Environmental engineering, Surveys, Mapping, Financing, Grants, Loans, Institutions, Industries, Federal government, Administrative agencies, Legislation, Legal aspects.

The Marine Exploration and Development Act would provide a program of marine exploration and development of the resources of the Continental Shelf. The United States would assume responsibility for programs of exploration and development of the resources, pursuant to rights obtained under

the Convention on the Continental Shelf, through encouragement of private investment and dissemination of information. A Marine Exploration and Development Commission would be established. The Commission would formulate and carry out programs for purposes of exploration and development of the marine resources of the Continental Shelf and its waters, including programs for expeditions, surveys, and development of an engineering capability for exploitation of the marine resources. The Commission would be authorized to enter into agreements with other government agencies and with public or private scientific institutions or enterprises for the carrying out of activities authorized by this Act. A Marine Exploration and Development Fund would be established to provide loans or grants authorized by this Act to public or private scientific institutions or business enterprises. Provisions for monetary appropriations and dissemination of information would also be made under the Act. (Smiljanich-Florida)
W71-08235

CONSERVATION DIRECTORY 1971.
National Wildlife Foundation.

The National Wildlife Foundation, Wash, DC (1970). 152 p, 2 append.

Descriptors: *Administrative agencies, *Organizations, *Institutions, *Conservation, Natural resources, Professional societies, Technical societies, Personnel, Management, Leadership, Occupations, Classification, Publications, Information retrieval, Universities, History, Engineering personnel, Professional personnel, Scientific personnel, Water resources, Administration, Federal government, State governments, Local governments, Legal aspects.
Identifiers: *Directories.

Agencies, committees, organizations and officials concerned with natural resource use and management are listed in this directory, including relevant information such as their general purposes and organization, and the addresses, phone numbers and names of their officials. Among the organizations listed are: (1) congressional committees; (2) federal executive departments; (3) federal independent agencies; (4) international, national and interstate governmental commissions; (5) international, national and interstate private organizations; (6) state and territorial governmental agencies and private citizens groups, listed by state and territory; and (7) Canadian provincial territorial agencies and citizens groups. A list of major colleges and universities offering professional training for a career in natural resources management and a listing of fish and game commissioners and directors of the United States and Canada are appended, along with a list of periodicals of interest. (Smiljanich-Florida)
W71-08236

WATER FOR WESTSTATE, USA: THE ASSOCIATION IN THE POLITICS OF WATER RESOURCE DEVELOPMENT,
Eddie B. Eiselein.
Dept of Anthropology, Univ of Arizona (1969). 271 p, 27 fig, 18 tab, 136 ref, 1 append.

Descriptors: *Water resources development, *Decision making, *Political aspects, *Organizations, Southwest US, Institutions, Conservation, Social aspects, Water policy, Water resources, Institutional constraints, State government, Local governments, Recreation, Cooperation, Interstate, Personnel, Leadership, Legal aspects, Water management (Applied).
Identifiers: *Associations.

Water resources development in the American West is partially dependent upon a political process of decision-making. This political process is viewed by this dissertation as a system composed of various social units, and it is examined through the activities of one type of social unit--the formal voluntary association. Eight associations were studied over a period of eighteen months. Each of the associations was examined with regard to its structure and activities in water resource development, including: (1) the internal organization of the association, (2) the relationship of the association with the water-oriented power structure of the state, (3) the interrelationships with the other social units of the system, (4) the problems of associational success and failure, and (5) function of the association in the internal maintenance of the system and its output. The associations were found to decrease the potential for cooperation in many respects, yet did provide an informal and non-public setting for compromise and decision-making. The interdependency of the associations is discussed, along with the distribution of power throughout the system, particularly between the public and private sectors. (Smiljanich-Florida)
W71-08237

TEMPORARY CLOSURE OF WATERWAYS TO NAVIGATION; REMOVAL OF WRECKS AND OTHER OBSTRUCTIONS.
Corps of Engineers, Washington, D.C.

33 Code of Federal Regulations, Secs 209.180, 209.190 (1970). 4 p.

Descriptors: *Navigation, *Navigable waters, *Rivers and Harbors Act, *Federal jurisdiction, Navigable rivers, Accidents, Hazards, Safety, Adoption of practices, Administration, Administrative agencies, Federal government, Supervisory control (Power), Channel improvement, Canals, Harbors, Ships, Legislation, Legal aspects, Judicial decisions, Administrative decisions, Construction, Channels.
Identifiers: Administrative regulations.

Herein promulgated by the Secretary of the Army are procedures applicable to the closing of, or removal of obstructions from, navigable waterways. Factors to be evaluated in authorizing the temporary closing of a navigable waterway include: effects on navigation, times and duration of the closing, and necessity. Where no question as to necessity or propriety exists, the District Engineer may inform an applicant that the Department of the Army will not object for a stated period of time. All other cases will be forewarded to the Chief of Engineers. Section 8 of the Rivers and Harbors Act of 1890, sections 15, 19, and 20 of the Rivers and Harbors Act of 1899, and an act of September 17, 1965, govern the removal of wrecks and obstructions. Government removal, absent formal abandonment, involves the taking of private property. Removal is not generally undertaken unless an obstruction influences general navigation. Procedures are detailed for: (1) reporting accidents affecting navigation, (2) informing the Coast Guard, (3) requesting removal authority and funds, and (4) the marking of obstructions. Legal guidelines relating to removal authority and the establishment of owner abandonment are also provided. (Earl-Florida)
W71-08238

OILY-WATER SEPARATORS AND SEWAGE DISPOSAL SYSTEMS: VESSEL REQUIREMENTS.

33 Code of Federal Regulations, Secs 401.102-19, 401.102-20 (1970). 1 p.

Descriptors: *Ships, *Coast Guard regulations, *Oily water, *Sewage treatment, Oil wastes, Sewage disposal, Oil, Sewerage, Water pollution control, Pollution abatement, Water pollution sources, Waste water disposal, Sanitary engineering, Installation, Administration, Administrative agencies, Administrative decisions, Mechanical equipment, Supervisory control (Power), Legal aspects, Sea water, Separation techniques, Standards, Federal government, Waste disposal.
Identifiers: Administrative regulations.

Administrative regulations governing sewage an waste oil products emanating from vessels a herein detailed. It is recommended, and effecti January 1, 1970, mandatory, that vessels n equipped with ordures containers shall be equipp with approved sewage disposal systems. Vesse which cannot contain waste oil products or bil water containing such products shall be equipp with oily water separators or other equipment f extracting oil wastes before discharge. (Ea Florida)
W71-08239

OPERATION OF RESERVOIR IN INTERES OF FLOOD CONTROL.
Corps of Engineers, Washington, D.C.

33 Code of Federal Regulations, Title 33, Ch 2, S 208.17 (1970). 1 p.

Descriptors: *Vermont, *Flood control, *Res voir operations, *Water levels, Dams, Reservoi Regulation, Projects, Hydroelectric pow Streams, Rivers, Streamflow, Spillways, Engine ing structures, Flow control, Conduits.

In the interest of flood control, the State of V mont shall operate the Waterbury Dam and Res voir pursuant to this federal regulation. Above specified level, storage space in the reservoir sh be reserved for temporary detention of flo waters. The three tainter gates shall be suspend in their open position except when being utiliz for flood control. The regulation describes the c cumstances under which the tainter gates shall closed. The State of Vermont shall furnish the D trict Engineer of the Corps of Engineers a mont report showing: (1) the daily elevation of the res voir pool, (2) daily reservoir inflow, and (3) da releases over the uncontrolled spillway through tainter gates and through the bypass cond Whenever the reservoir exceeds a specified le the state shall keep the District Engineer curren informed of reservoir data. These regulations subject to modification in time of emergen (Duss-Florida)
W71-08240

FEDERAL ASSISTANCE FOR RESOUR CONSERVATION DEVELOPMENT PROJECT
House Report No 1247, 91st Cong, 2d Sess, 8 Code Cong and Admin News, p 2825-2828 (197 4 p.

Descriptors: *Resource development, *Wa resources development, *Projects, *Conservati Multiple-purpose projects, Federal project poli Wildlife, Wildlife conservation, Fish, Fish con vation, Recreation, Recreation facilities, Pro planning, Federal government, Administra agencies, Administration, Cost sharing, Gov ment finance, Land, Easements, Right-of-w Contracts, Legislation.
Identifiers: *Bankhead-Jones Farm Tenant Act.

Recommending passage of an amendment to Bankhead-Jones Farm Tenant Act to authorize Secretary of Agriculture to furnish finan assistance for resource conservation and devel ment projects, this House Report considers the p pose, background, need for, and other aspect the bill. The measure would authorize the Secr ry to bear an equitable portion of the cost water-based fish and wildlife or recreational jects developed under the Bankhead-Jones Cost-sharing would be limited to water-based jects, and provisions delineate which projects qualify for assistance. Resource conservation development programs with federal plan assistance have existed since 1963, and such grams are designed to strengthen the rural ec my. There is need for the present bill bec development of resources for outdoor recrea purposes has great potential for economic gro Such resources are in short supply throughout nation. The bill would aid in the developmen multiple-purpose projects. A letter from the

ıent of Agriculture is included and recom-
ls passage of the bill. (Duss-Florida)
-08241

NDARDS FOR PROTECTION AGAINST
IATION.
ic Energy Commission, Washington, D.C.

ode of Federal Regulations, Secs 20.1, 20.2,
1 thru 20.305 (1970). 4 p.

iptors: *Radioactive waste disposal,
ioactive wastes, *Sewage disposal, *Nuclear
s, Environmental sanitation, Waste disposal,
rage, Water pollution sources, Radiation,
activity, Nuclear energy, Environmental ef-
Soil environment, Soil management, Soil
al fields, Groundwater, Surface waters, In-
tion, Administration, Administrative deci-
Administrative agencies, Adoption of prac-
Water pollution control.
fiers: *Atomic Energy Act of 1954.

l pursuant to the Atomic Energy Act of 1954,
administrative regulations establish radiation
ction standards for AEC licensed activities.
censee shall dispose of material except by
er to an authorized recipient or as provided
. Disposal application for licensed waste
ial should include a description of the materi-
l pertinent environmental information. This
les: (1) topographical, geological, and
rological characteristics; (2) ground and sur-
water usage; (3) other potentially affected
ies; and (4) procedures to minimize risk. Ap-
ions will not be accepted to dispose of
r's materials on private lands. No licensee
discharge materials into a sanitary sewerage
n unless: (1) the material is readily soluble or
rsible and both the gross quantity disposed
he concentration level, when diluted by the
ge daily sewage release, do not exceed stan-
herein set forth. Material shall not be
sed of by burial in soil unless: (1) the quantity
l does not exceed standards set forth herein,
urial is at a minimum of four feet, and (3)
are no more than twelve successive burials
ated by at least six feet. Without specific ap-
l, material shall not be treated or disposed of
ineration. (Earl-Florida)
08242

AND WATER MANAGEMENT ON MILI-
INSTALLATIONS.
rtment of Defense, Washington, D.C.

de of Federal Regulations, Part 234 (1970).

iptors: *Water management (Applied), *Soil
gement, *Military aspects, *Water utilization,
ation, Administrative agencies, Administra-
Projects, Project planning, Conservation,
al resources, Water pollution, Pollution
ment, Water supply, Domestic water, Irriga-
rrigation systems, Irrigation, Operations and
enance, Land use, Runoff.

ribing procedures for implementing a
ced and integrated program for soil and water
gement and related natural resources as
ed by the Department of Defense (DOD),
administrative regulations apply to all DOD
ers. For purposes of the regulations, various
of grounds on military installations are
d. The objective of the regulations is to con-
develop, maintain and manage lands in an ef-
manner and, among other things, to
rate in pollution abatement and waste
al. Soil and water conservation plans shall be
oped by professionally competent personnel
e applied continuously at all installations hav-
ignificant land management problems or
nsibility. Special problems of conservation
development of natural resources shall be
fied and included as part of the plans. As re-
to water management, irrigation shall be limited to areas where supplemental water is essential to establish improved types of vegetation. Irrigation systems shall utilize the minimum amount of water necessary to support vegetation and not interfere with military and domestic water supply requirements. The regulations prescribe procedures for project proposals, construction and program evaluation. (Duss-Florida)
W71-08243

KEY LARGO CORAL REEF PRESERVE.
Department of the Interior, Washington, D.C.

Code of Federal Regulations, Title 43, Subtitle A, part 15 (1970). 3 p.

Descriptors: *Reefs, *Supervisory control (Power), *Preservation, *Florida, Federal jurisdiction, Boating regulations, Water pollution control, State governments, Fishing, Dredging, Coordination, Federal government, Marine geology, Shoals, Regulation, Adoption of practices, Integrated control measures, Non-structural alternatives, Administrative agencies, Administrative practices, Administration, Legal aspects, Legislation, Wildlife conservation, Natural resources.

The Department of the Interior herein sets forth regulations governing the operation of the key Largo Coral Reef Preserve. It is the policy of the Department to cooperate with the State of Florida in preserving the reef. The removal or destruction of natural reef features or marine life is forbidden. No dredging excavating, or filling operations are permitted in the Preserve. The dumping or depositing of refuse or polluting substances is prohibited. No person shall willfully destroy, molest, or tamper with any wrecks or cargoes thereof within the Preserve. The removal or defacing of Preserve signs and monuments is forbidden. Spear fishing or the use of poisons, electric charges, or other such fishing methods is prohibited. Skin diving for observation or pleasure is encouraged. The collection of scientific specimens shall be allowed only under written permit. No watercraft shall be operated so as to strike or damage natural features. The use or possession of explosives or dangerous weapons within the Preserve is forbidden. The Preserve may be closed to the public in the event of emergencies. Accidents shall be promptly reported. All federal acts and Florida laws and regulations shall be enforced. (Earl-Florida)
W71-08244

MANAGEMENT OF LANDS AFFECTED BY THE WILD AND SCENIC RIVERS ACT.
43 Code of Federal Regulations, Secs 6223.0-1 thru 6223.0-6 (1970). 2 p.

Descriptors: *Rivers, *Environment, *Conservation, *Administration, Legislation, Regulation, Wildlife, Recreation, Fish, Federal government, Benefits, Natural streams, Administrative agencies.
Identifiers: *Wild and Scenic Rivers Act.

Promulgated pursuant to the Wild and Scenic Rivers Act, these regulations seek to foster the aims of that Act. The Wild and Scenic Rivers Act provides that certain selected rivers shall be preserved in their free-flowing condition and their immediate environments protected for the benefit and enjoyment of present and future generations. The purpose of these regulations is to provide guidelines for management of lands affected by the Act and to assure that lands are managed in a manner consistent with the purposes of the Act. The policy is to identify lands affected by the Act as soon as possible. (Duss-Florida)
W71-08245

OPEN BEACHES ACT OF 1971 (A BILL DECLARING A PUBLIC INTEREST IN THE OPEN BEACHES OF THE NATION).

Senate Bill 631, 92nd Cong, 1st Sess (1971). 9 p.

Descriptors: *Beaches, *Public rights, *Public benefits, *Condemnation, Recreation, Public lands, Legal aspects, Land tenure, National seashores, Federal government, State governments, Federal jurisdiction, State jurisdiction, Compensation, Condemnation value, Easements, Eminent domain, Legislation.

Under this proposed legislation the public shall have a free and unrestricted right to use the beaches of the United States to the full extent that such public right may be extended consistent with the constitutional property rights of littoral landowners. No person shall construct or maintain an obstruction which interferes with the right of the public to enter, lease, cross or use the public beaches. The United States district courts may adjudicate actions: (1) to establish and protect the public right to the beaches, (2) to determine the existing status of title, and (3) to condemn such easements as are necessary to accomplish the purposes of this bill. Certain evidentiary rules are set out by this bill. This bill does not interfere with the authority of the states to act for the public benefit. Interests in land recovered under authority of this bill shall be subject to state ownership, and the states must provide at least 25% of the cost of condemnation. The federal government and the states shall act in joint partnership to accomplish the purposes of this bill. Definitions of relevant terms are provided. (Robinson-Florida)
W71-08246

NATIONAL MARINE WATERS POLLUTION CONTROL AND QUALITY ENHANCEMENT ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
Senate Bill 1011, 92d Cong, 1st Sess (1971). 10 p.

Descriptors: *Waste dumps, *Coasts, *Waste disposal, *Water pollution control, Pollution abatement, Sewage disposal, Ultimate disposal, Oceans, Continental Shelf, Sea water, Shores, Waste treatment, Coastal structures, Offshore platforms, Ships, Water pollution sources, Water pollution, Treatment facilities, Standards, Regulation, Administrative agencies, Federal government, State governments, Legislation, Legal aspects.
Identifiers: *Contiguous zone.

Entitled the National Marine Waters Pollution Control and Quality Enhancement Act of 1971, this proposed amendment to the Water Pollution Control Act would provide means and measures to control the discharge of wastes into the waters of the contiguous zone and the sea. No persons could discharge wastes into the waters of the contiguous zone from any vessel, except sewage discharged from marine sanitation devices, or from any onshore or offshore facility. No wastes could be discharged into waters beyond the contiguous zone unless permitted by the Environmental Protection Agency pursuant to regulations promulgated in this Act. Civil penalties for violations are provided, along with procedures for enforcement. The Environmental Protection Agency would be given authority to issue regulations governing the discharge of wastes in waters beyond the contiguous zone by establishing quantities, times, locations, circumstances, and conditions of such discharges. Limitations on the regulations are set forth, along with provisions for research and grants for the construction of treatment works. (Smiljanich-Florida)
W71-08247

BUREAU OF LAND MANAGEMENT PROGRAM POLICY--ENVIRONMENTAL CONSIDERATIONS.
Bureau of Land Management, Washington, D.C.

Federal Register, Vol 36, No 65, Saturday, Apr 3, 1971, p 6422-6423.

Descriptors: *Land management, *Environmental effects, *Public lands, *Adoption of practices,

Land resources, Water resources, Natural resources, Land development, Conservation, Land use, Water management (Applied), Water resources development, Project purposes, Long-term planning, Federal government, Administrative agencies, Legislation, Administration, Coordination, Regulation, Industrial production, Social needs, Ecology, Legal aspects, Programs.

Pursuant to the National Environmental Policy Act and an executive order, the Secretary of the Interior herein amends regulations relating to the Bureau of Land Management. Interested parties submitted suggestions which are incorporated into the revised regulations. Environmental considerations in land management shall include: (1) the attainment of the widest range of beneficial uses of the environment without undue environment degradation or risk to health or safety; (2) the attainment of optimum production of land products consistent with acceptable environmental quality; and (3) the preservation of historic, cultural and natural aspects of the national heritage. Matters to be considered are: (1) existing or future economic and social needs; (2) effect on other resource values; (3) inter-agency coordination and cooperation; (4) consistency with national programs; (5) compatibility of possible uses; and (6) compatibility with long-term productivity and environmental integrity. (Smiljanich-Florida)
W71-08248

THE ROLE OF THE COURT IN PROTECTING THE ENVIRONMENT--A JURISPRUDENTIAL ANALYSIS,
Manton M. Grier.
South Carolina Law Review, Vol 23, No 1, p 93-113, 1971. 21 p, 80 ref.

Descriptors: *Resource allocation, *Decision making, *Judicial decisions, *Institutions, Adjudication procedure, Pollution abatement, Environment, Water allocation (Policy), Resource development, Water resources development, Institutional constraints, Governments, Legislation, Water pollution, Water pollution control, Water quality, Water distribution (Applied), Political aspects, Social aspects, Social values, Water policy, Legal aspects.

Protection for the environment is increasingly being sought through the courts. An examination is made in this article of the proper role that a court as an institution should play in protecting the environment. When courts are asked to solve environmental problems, questions arise as to whether they are institutionally suited to solve the problems and whether the courts have the constitutional power to consider the problem. The end result of adjudication is the formal declaration of rights and wrongs. Adjudication is therefore not a proper form of deciding how the community should allocate its scarce resources. Questions involving such discretion should be left to the legislature. The polycentric features of resource allocation, wherein there are many interacting centers of influence, also suggest that courts should play a more limited role in trying to solve the environmental crisis. The constitutional aspects of the institutional limits of adjudication are 'standing' and 'political questions'. The court's role as an institution should be to enforce the basic requirements of social living by enjoining forms and levels of pollution that constitute a threat to the continued existence of society. (Smiljanich-Florida)
W71-08249

ENVIRONMENTAL LAW--NUISANCE--INJUNCTIVE RELIEF DENIED IN PRIVATE ACTION FOR NUISANCE CAUSED BY INDUSTRIAL POLLUTER.
New York University Law Review, Vol 45, p 919-927, 1970. 45 ref.

Descriptors: *Air pollution, *Pollution abatement, *Remedies, *New York, Legal aspects, Judicial decisions, Environment, Environmental effects, Legislation, Pollutants, Air pollution effects, Damages, Public health, Water pollution, Water pollution control.
Identifiers: *Injunctions.

Considering the availability of injunctive relief in New York in private actions for pollution abatement, this article discusses the decision in Boomer v. Atlantic Cement Co, 26 N.Y. 2d 219, 257 N.E.2d 870, 309 N.Y.S.2d 312 (1970). In Boomer plaintiffs sought to restrain defendant cement plant from emitting dust and raw materials and conducting blasting operations to the detriment of plaintiff's property. In the ultimate decision the Court of Appeals of New York granted plaintiffs a temporary injunction, to be vacated upon the payment of permanent damages by defendant. The majority found this to be the most equitable and practicable remedy, compensating plaintiffs and avoiding closing defendant's plant. The effect of the decision was to apply a new balancing test in New York; an injunction should not be granted when the harm to the defendant in granting it is greater than to the plaintiff in denying it. The central argument of the majority is that private actions are not the most practical method for effective control of polluters, that is, questions of pollution control should be decided by the legislature and not by private lawsuits. This article disagrees with the Boomer decision. The decision unnecessarily inhibits the rights of individuals, appears to contravene the actual intent of the legislature, and does not provide adequate incentive for defendants to abate pollution. (Duss-Florida)
W71-08250

ENVIRONMENTAL REPORTS FOR NUCLEAR POWERPLANTS.
Atomic Energy Commission, Washington, D.C.

Federal Register, Vol 36, No 52, Wednesday, Mar 17, 1971, p 5150.

Descriptors: *Nuclear powerplants, *Environmental effects, *Permits, *Regulation, Federal government, Operations, Administration, Administrative agencies, Construction.
Identifiers: *National Environmental Policy Act of 1969.

Under the Atomic Energy Commission's regulations for implementing the National Environmental Policy Act of 1969, applicants for nuclear powerplants and licenses are required to submit an environmental report at the time they file an application for a construction permit. They are required to update this report, to the extent that environmental consideration differ significantly from those in the earlier report, at the time they file for an operating license. The Atomic Energy Commission has prepared a draft guide for such reports. Comments and suggestions for improvements in this draft are encouraged. (Duss-Florida)
W71-08251

ENVIRONMENTAL QUALITY.
Department of Agriculture, Washington, D.C.

Federal Register, Vol 36, No 52, Mar 17, 1971, p 5148-5149.

Descriptors: *Administrative agencies, *Administration, *Environment, *Environmental effects, Legislation, Federal government.
Identifiers: *National Environmental Quality Act.

Since the Department of Agriculture has many concerns and responsibilities regarding environmental quality, the Secretary has enunciated a general environmental policy for the Department in a Secretary's memorandum. The memorandum pays particular attention to the National Environmental Policy Act of 1969, related executive orders, and other guidelines and directives from the Office of the President. (Duss-Florida)
W71-08252

OIL POLLUTION FROM SHIPS,
Richard Nixon.
116 Cong Rec H 4571 (daily ed), 6 US Code C and Admin News, p 1947-1950 (1970). 4 p.

Descriptors: *Water pollution sources, *Si *Oil, *Pollution abatement, Oil wastes, Oily w Federal government, Pollutants, Internati waters, Harbors, Water pollution effects, Trea Legislation, Oil industry, Port authorities, Wa Naval architecture, Navigation, Coast Guard r lations, International law, Standards, Water q ty, Radio communication systems, Permits, L aspects.
Identifiers: *Presidential messages, Oil spills.

The President of the United States herein sub to Congress a special message with his prop for curbing oil pollution from ships. The increa seaborne oil transport has resulted in increase pollution hazards through ships collisions or v discharges. This message outlines actions Con should take to reduce the risks of oil pollu Among such proposals are: (1) the ratificati certain international conventions dealing wit pollution of sea waters; (2) enactment of the and Waterways Safety Act giving the Coast G additional authority to protect against oil spill requirement of direct radio communica between vessels; (4) the licensing of tow operators of uninspected vessels; and (5) financing of oil-spill cleanup operations thr the use of a revolving fund with reimburseme those responsible. In addition, executive mea to be taken include: (1) a search for effective tilateral action to prescribe international stan for the construction and operation of tanker increased surveillance along shorelines to dete spills; (3) the establishment of Harbor Ad Radar Systems; and (4) research and develop of emergency oil transfer and storage sys (Smiljanich-Florida)
W71-08253

HUDSON RIVERWAY--LICENSE APPL TIONS.

Senate Report No 771, 91st Cong, 2d Sess, Code Cong and Admin News, p 1433-1435 (1 3 p.

Descriptors: *Hudson River, *River basin de ment, *Permits, *Interstate compacts, Legisl Water resources development, Water con tion, Natural resources, Political aspects, policy, Water resources, River basins, River tional historic sites, Environmental effects, dination, Administrative agencies, Negoti Recreation, Project planning, Federal govern State governments, Legal aspects.

The Senate Interior and Insular Affairs Com herein recommends passage of an amendm existing legislation. The existing act provid regulation of water resources of the Hudson way. It grants congressional consent to an state compact relating to the preservatio development of the natural, historic, and r tional resources of the Hudson River Ba order to protect the resources of the river while compact negotiations were being he act provides for consultation between the Se of the Interior and any agencies contemplat tivity within or affecting the Riverway. T further sets forth license requirements ac which might affect the resources of the H Riverway. The amendments herein unde sideration would extend the deadlines conta the existing act. The Committee note although the National Environmental Policy 1969 imposes more rigorous requirements proval of proposed activities having environ impact, the amendments under consid would provide interim protection whi procedures of that act are still being estab The Committee report includes a letter fr Department of the Interior expressing appr the proposed amendment. (Smiljanich-Flori
W71-08254

ÉHES V. WASHINGTON: SOME FEDERAL MMON LAW IN THE REAL PROPERTY A,
ert E. Beck.
h Dakota Law Review, Vol 47, No 1, p 77-98, . 104 ref.

riptors: *Accretion (Legal aspects), *Boundasputes, *Federal jurisdiction, *State jurisdic- Land tenure, Property (Boundaries), nington, Riparian land, Riparian rights, Beds, ership of beds, Oceans, Navigable waters, navigable waters, Water law, Federal govern-, Bodies of water, Legal aspects, Judicial deci-

yzing the decision of the United States eme Court in Hughes v. Washington, 389 U.S. 1967), this article discusses federal common n the real property area with specific regard to rship of accreted land. In Hughes the Court that federal law controlled, in Washington the ownership of accretion gradually sited by the ocean on land which had been eyed by the United States prior to Washing- statehood. It thus overruled the Supreme t of Washington which had held, because of a itutional provision, that the alluvion belonged e state. According to the author there are imnt questions as to the basis and scope of the ion. There are two major problems in this type se: (1) Is there a federal question; and (2) If is a federal question, should local law apply. uthor discusses prior federal cases and finds precedent for finding a federal question or exng local law in such cases. Because of the parr facts of Hughes, the author feels there could been a federal question and the decision was ct. Nevertheless, the case should not apply to in different legal situations and should apply where there is a federal grant prior to ood and involving tidelands. (Duss-Florida) 08255

RONMENTAL LITIGATION--WHERE ACTION IS,
P. Grad, and Laurie R. Rockett.
al Resources Journal, Vol 10, No 4, p 742-Oct 1970. 71 ref.

riptors: *Judicial decisions, *Natural rces, *Legal aspects, *Environment, Environl effects, Adjudication procedure, Non-struc- alternatives, Public rights, Administration, lation, Eminent domain, Institutional cons, Planning, Aesthetics, Wildlife conserva- Balance of nature, Governments, Federal nment, State governments, Administrative ies, Conservation.

ining the type of lawsuits included in the term onmental litigation', this article considers ier such litigation can make a significant conion to environmental protection. Because of dural prerequisites, negating substantive doc-, and judicial reluctance to enunciate broad in private litigation, litigation between e parties is rejected as an efficient vehicle for nmental protection. While recognizing the tant rule of enforcement litigation by public ics, the authors also reject enforcement litigaas an affirmative environmental protection . This view is grounded upon considerations inistrative reluctance in enforcing legislation rocedural and constitutional barriers to enment actions. The authors consider private s against public agencies, to compel environl protection, as the most significant area of nmental litigation. A discussion of recent and the expansion of standing compares ac- based on the preservation of a particular ce with the less successful actions seeking to t generalized environmental interests. al newly defined legal theories and re-evaluaof the administrative process, stimulated by nmental litigation, are evaluated. Dangers in tilization of environmental litigation and its ness as a device for focusing public attention inducing legislation are discussed. (Earl-a)

W71-08256

RIPARIAN RIGHTS.
In: Adkins, JC, Florida Real Estate Law and Procedure, Harrison Company, Atlanta, p 1611-1628 1960. 52 ref.

Descriptors: *Riparian rights, *High water mark, *Riparian land, *Florida, Navigable waters, Artificial use, State governments, Legislation, Legal aspects, Natural use, Navigation, Ownership of beds, Relative rights, Remedies, Riparian waters, Usufructuary right, Water pollution, Boating, Fishing, Land tenure, Real property, Accretion (Legal aspects), Docks.

The nature of riparian rights are considered in the first section of this article. Riparian rights are defined, and limitations upon riparian rights are set forth. The relationship between riparian rights and conveyances of riparian land is discussed. The second section defines the limits of riparian land ownership. Holdings of Florida courts are analyzed with respect to definitions of: (1) ordinary high water mark, (2) ordinary high tide, and (3) shore. Rules promulgated by Florida courts for determining the location of the high water mark are considered. The common law right to erect wharves or piers for access to navigable waters, with the consent of the sovereign, is primarily considered in the third section. An invasion of the sovereign's property right or 'purpresture' is discussed. The remaining sections consider the remedy available for special injury to riparian rights and the severability of riparian rights from the land. (Hart-Florida)
W71-08257

AN ACT RELATING TO THE PUBLIC AND ENVIRONMENTAL HEALTH AMENDING THE FLORIDA AIR AND WATER POLLUTION CONTROL ACT BY PROVIDING ADDITIONAL GROUNDS FOR INJUCTIVE RELIEF.
Florida Laws, Ch 70-139, p 486 (1970), amending Fla Stat Sec 403.131.

Descriptors: *Florida, *Water pollution control, *Pollution abatement, *Remedies, Air pollution, Administration, Administrative decisions, Adoption of practices, State governments, Administrative agencies, Environment, Environmental sanitation, Supervisory control (Power), Adjudication procedure, Legislation, Legal aspects, Environmental effects.
Identifiers: Injunction (Prohibitory), Injunction (Mandatory).

The Florida Air and Water Pollution Control Act is hereby amended to provide additional grounds for injunctive relief proceedings. Upon a finding that a generalized air or water pollution condition has created an emergency requiring immediate action to prevent harm to property or animal, plant, or aquatic life, injunctive relief shall be sought. (Earl-Florida)
W71-08258

AN ACT RELATING TO THE DEPARTMENT OF AIR AND WATER POLLUTION CONTROL: ENFORCEMENT PROCEDURE FOR TEMPORARY AND NON-CONTINUING VIOLATIONS.

Florida Laws, Ch 70-114, p 425-426 (1970) amending Fla Stat Sec 403.121.

Descriptors: *Florida, *Pollution abatement, *Remedies, *Administrative decisions, Water pollution control, Air pollution, Legislation, Legal aspects, Administration, Administrative agencies, Supervisory control (Power), Constraints, State governments, Local governments, State jurisdiction, Pollutants, Pollutant identification, Water quality control.

The alternative enforcement procedures provided the Florida Department of Air and Water Pollution Control, in this amendment to existing legislation, shall not apply to municipalities or political subdivisions. Upon reason to believe that a temporary or non-continuing violation of this act has occurred, the director of the Department or his delagatee may issue a citation ordering corrective action. Citable violations include, but are not limited to: (1) spills of polluting substances, (2) open burning, and (3) sudden discharges of pollutants. No administrative hearing shall be required. Citations shall state the date of the corrective action's commencement and completion. Cases in which such dates are not met may be referred to the prosecuting attorney. When warnings would best serve the public interest, the director shall not be required to report minor violations. Citations are appealable and may be suspended pending a departmental hearing. It shall be the duty of prosecuting attorneys to investigate and, when warranted, prosecute reported violations. Violations of this subsection shall be a misdemeanor. (Earl-Florida)
W71-08259

NICHOLS V VILLAGE OF MORRISTOWN (LIABILITY OF CITY FOR BACKWATER FLOODS DUE TO CONSTRUCTION OF CULVERTS).
257 NW 82-83 (Minn 1934).

Descriptors: *Minnesota, *Obstruction to flow, *Culverts, *Floods, Alteration of flow, Natural flow doctrine, Riparian rights, Streamflow, Backwater, Overflow, Rain, Streams, Riparian land, Relative rights, Ditches, Bridges, Local governments, Cities, Judicial decisions, Legal aspects.

Plaintiff landowner sued defendant seeking to enjoin the obstruction of a watercourse and to compel the city to remove a culvert and install a bridge in its place. Plaintiff also claimed damages for past inundations of his property. Plaintiff contended that in replacing a bridge across a stream with a tile culvert and ditch, defendant had interfered with the natural flow of the watercourse and had caused plaintiff's lands to flood. Defendant contended that plaintiff's lands were naturally subject to occasional floods due to a backup of water from a river into the stream tributary. In affirming a lower court judgment for defendant, the Supreme Court of Minnesota noted that plaintiff's lands had been subject to floods before the bridge was replaced by a culvert. The city had provided an adequate outlet for the flood waters. The outlet was reasonably sufficient for such rains as might be anticipated. Defendant had therefore not substantially interfered with the natural flow of the watercourse. (Smiljanich-Florida)
W71-08266

WATER QUALITY STANDARDS: ENFORCEMENT AND COMPLIANCE,
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-08305

DEVELOPING AND APPLYING STANDARDS AT THE STATE LEVEL,
Pennsylvania Dept. of Health, Harrisburg. Div. of Water Quality.
For primary bibliographic entry see Field 05G.
W71-08308

ENVIRONMENTAL INFLUENCE ON POWER OPERATION,
American Electric Power Service Corp., New York.
For primary bibliographic entry see Field 05G.
W71-08312

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION, BAYOU METO AND TRIBUTARIES, JACKSONVILLE ARKANSAS.
Corps of Engineers, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W71-07933

FLOOD PLAIN INFORMATION, MIDDLE FORK FORKED DEEP RIVER AND TRIBUTARIES, VICINITY OF HUMBOLDT, TENNESSEE.
Corps of Engineers, Memphis, Tenn.
For primary bibliographic entry see Field 04A.
W71-07934

6G. Ecologic Impact of Water Development

LAND AND WATER RESOURCES PLANNING ACT OF 1971 (A BILL TO AMEND THE WATER RESOURCES PLANNING ACT TO INCLUDE PROVISION FOR A NATIONAL LAND USE POLICY).
For primary bibliographic entry see Field 06E.
W71-07723

ASWAN DAM LOOSES A FLOOD OF PROBLEMS,
For primary bibliographic entry see Field 04A.
W71-07821

THE CROSS-FLORIDA BARGE CANAL: A LESSON IN ECOLOGY,
Suzy Fisher.
Civil Engineering, Vol 41, No 4, p 44-48, Apr 1971. 5 p, 2 fig.

Descriptors: *Canal construction, *Ecology, *Environmental effects, *Florida, Canals, Governments, Fish conservation, Wildlife conservation, Water pollution, Algae, Surface waters.
Identifiers: *Environmental protection.

President Nixon's decision to halt construction of the Cross-Florida Barge Canal last January climaxed an extended battle between conservationists and the U. S. Army Crops of Engineers. After the Corps began construction in 1964, unfavorable reports trickled in from Interior Department agencies. The Bureau of Sport Fisheries and Wildlife said canal development would harm animals living in the region. Later, the Federal Water Pollution Control Administration predicted that dense algal blooms would develop in canal impoundments, restricting uses of these waters. Florida's Game and Fresh Water Fish Commission added that canal construction would impair sport fishing. Others charged the benefit/cost ratio set for the project was unrealistic. Conservation groups organized to fight the canal in the late Sixties. This experience indicates that in the future, large-scale development projects will go hand-in-hand with environmental safeguards, and those who neglect environmental standards will find their projects in trouble. (Woodard-USGS)
W71-08105

DESERTIFICATION VERSUS POTENTIAL FOR RECOVERY IN CIRCUM-SAHARAN TERRITORIES,
Cairo Univ., Giza (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 04C.
W71-08136

A PROSPECT OF LAKE KARIBA,
University Coll. of Rhodesia, Salisbury.
For primary bibliographic entry see Field 02H.
W71-08141

07. RESOURCES DATA

7A. Network Design

DATA ERROR EFFECTS IN UNIT HYDROGRAPH DERIVATION (Discussion),
Krishan P. Singh.
J Hydraulics Div, Am Soc Civil Engrs, Vol 96, No HY7, p 1633-1636, Jul 1970. 1 tab, 2 ref.

Descriptors: *Unit hydrographs, *Methodology.
Identifiers: *Error analysis, *Data analysis.

The author comments upon the analysis of the errors of the first three of the four methods of unit hydrograph derivation studied in the original paper: (1) Laguerre Functions Method (LFM); (2) Harmonic Series Method (HSM); (3) Least Square Method (LSM); and (4) Gamma Distribution Method (GDM); when the basic data (the hyetograph and hydrograph) were in error. The mean errors, as a percentage, for the four methods of derivation using error-free data are presented in a table. Errors due to functional structure and flexibility of the methods are demonstrated. Further investigation is suggested concerning the fact that the derived unit hydrographs will differ more from the true ones for smaller durations of rainfall excess and errors in data. (See also W70-02454)
W71-07842

COMPUTER DETERMINATION OF THE GEOMETRY AND TOPOLOGY OF STREAM NETWORKS,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences; and Toronto Univ. (Ontario). Dept. of Civil Engineering.
D. M. Coffman, and A. K. Turner.
Water Resources Research, Vol 7, No 2, p 419-423, Apr 1971. 5 p, 2 fig, 2 tab, 7 ref. OWRR Project A-007-IND (1).

Descriptors: *Drainage patterns (Geologic), *Geomorphology, *Topography, *Terrain analysis, Watersheds (Basins), Networks, Mathematical studies, Drainage systems, Channel morphology.
Identifiers: *Topology, *Stream networks.

Binary string descriptions of stream networks provide only topologic information. Applied geomorphic and engineering studies of drainage basins require network geometry as well as topology. An extension of binary string methods of data collection permits both stream classification and computation of geometric parameters. Two years' experience demonstrates the ability of this single data collection operation to provide all the information necessary for a complete analysis of real stream networks. (Knapp-USGS)
W71-07911

A PROPOSED STREAMFLOW DATA PROGRAM FOR SOUTH CAROLINA,
Geological Survey, Columbia, S. C.
Jeffrey T. Armbruster.
Geological Survey Open-file Report, 1970. 30 p, 1 fig, 2 plate, 8 tab, 8 ref.

Descriptors: *Streamflow, *Network design, *Data collections, *South Carolina, Planning, Stream gages, Hydrologic data, Regression analysis, Gaging stations, Natural flow, Regulated flow, Peak discharge.
Identifiers: Streamflow characteristics, Data evaluation.

An evaluation of the available streamflow data in South Carolina was made to provide guidelines for planning future surface-water data programs. The basic elements in the evaluation procedure were (1) establishment of objectives and goals of the program, (2) examination and analysis of all available data to determine which goals have already been met, (3) consideration of alternate meth of meeting the remaining goals, and (4) identif tion of elements that should be included in the ture program. Four categories of data that form framework of program design are current-purp data, planning and design data, data to define l term trends, and stream environment data. An curacy goal for planning and design data o equivalent of 10 years of record was specified minor streams. Many of the goals can be me generalizing data for gaged basins by regres analysis. Appropriate changes could be made ir present data program based on this fact. A Stre flow data program based on the guide developed in this study is proposed. (Wood USGS)
W71-07970

USU TELEMETERING PRECIPITATION G. NETWORK,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 02B.
W71-08131

TELEMETRY SYSTEM MODIFICATIONS 1968-69 OPERATION,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 02B.
W71-08132

RANDOM-WALK MODEL OF STREAM WORK DEVELOPMENT,
IBM Watson Research Center, Yorktown He N.Y.
J. S. Dmart, and V. L. Moruzyi.
Available from the National Technical Inform Service as AD-717 370, $3.00 in paper copy, $ in microfiche. ONR Contract No N00014-0188, Task No NR 389-155, Technical Repo 2, Oct 1970. 21 p, 5 fig, 4 tab, 16 ref.

Descriptors: *Mathematical models, *Com programs, *Streams, *Network design, G rates, Runoff, Simulation analysis.
Identifiers: *Random-walk model.

A random-walk, headward-growth model of s network development in a region of un lithology and uniform slope was proposed principal difference from previous models wa the probability of growth was made depende the area contributing runoff to the stream t this model, a decision about whether a given s segment should be allowed to grow was reach examining the area immediately upslope. To g some feeling for the range and applicability model, two particular versions, A and B, wer grammed and tested. The major diffe between the two versions was that Version A allow no growth at all at active site A while V B would allow growth to the right only. Eac sion was run 25 times for each of six dif values of vertical dimension (w) and whe horizontal dimension (L) was set at a constan two versions were selected for simplicity wi results quantitatively satisfactory and whe input data and fewer arbitrary rubs were req A major advantage was that all the importa work variables, including drainage density an let density, came naturally out of the simu processes. (Kriss-Cornell)
W71-08190

7B. Data Acquisition

HONEYCOMB THERMAL TRAP,
New Mexico State Univ., University Park.
P. Pellette, M. Cobble, and P. Smith.
Journal of Solar Energy, Vol 12, No 2, p 26 1968. 5 fig, 4 ref. OWRR Project A-015-N (1).

Descriptors: *Heat transfer, Water utili *Temperature, *Solar radiation, Radiation, mal radiation, Thermal conductivity.

evacuated cylindrical chamber, herein called a
neycomb thermal trap, was developed and
ted, for the purpose of achieving moderately
h temperatures without using concentrating
thods. The device, which uses a hexagonal
neycomb core to diminish re-radiation losses,
ieved temperatures on the order of 400 deg F
a target plate located in the interior of the
nder.
1-07706

**OW CHARACTERISTICS IN FLOOD-CON-
OL TUNNEL 10, FORT RANDALL DAM,
SSOURI RIVER, SOUTH DAKOTA.
DRAULIC PROTOTYPE TESTS,**
ny Engineer Waterways Experiment Station,
ksburg, Miss.
primary bibliographic entry see Field 08B.
1-07802

**ADING INVERTED PYRANOMETERS AND
ASUREMENTS OF RADIATION
FLECTED FROM AN ALFALFA CROP,**
raska Univ., Lincoln.
V. Brown, Norman J. Rosenberg, and P. C.
aiswamy.
RR Project No A-019-NEB (1). Water
ources Research, Vol 6, No 6, p 1782-1786,
1970. 4 fig, 17 ref.

criptors: *Alfalfa, *Solar radiation,
isotropy, *Albedo, On-site data collections,
brations, Equipment, Instrumentation, Testing,
asurement.
ntifiers: *Pyranometers, *Short-wave radiation
flected).

nometers are used to measure the shortwave
ation reflected by natural surfaces, including
cultural fields. Measurement problems may
to associated data errors. Cylindrical shades
be necessary to restrict the view of inverted
nometers if shortwave radiation is anistropi-
y reflected. Since measurements must often be
le over small plots, the instrument view angles
t also be restricted. Measurement experiments
e performed in a uniform 2 ha. alfalfa field dur-
the summer. It was found that: (1) Measuring
ected radiation, and Eppley pyranometer
ires shading above the plane of the sensor; (2)
alfalfa crop reflects shortwave solar radiation
otropically, and shades that restrict the view
e of an inverted pyranometer to less than 160
rees result in underestimates of solar radiation
e unshaded instruments result in overestimates.
sey-Arizona)
1-07812

DEFINITION OF SALINITY,
ntific Committee on Oceanic Research; and In-
ational Council for the Exploration of the Sea,
rography Committee; and International As-
ation of the Physical Sciences of the Ocean.
primary bibliographic entry see Field 02L.
1-07874

**CTROPHOMETRIC DETERMINATION OF
LL QUANTITIES OF PHENOLS, (IN RUS-
N),**
cow State Univ. (USSR).
primary bibliographic entry see Field 05A.
-07876

**NTRIBUTION TO THE THEORY OF TRICK-
G FILTER PERFORMANCE,**
ver Univ., Colo. Dept. of Chemical Engineer-

primary bibliographic entry see Field 05D.
-07877

**TRUMENTATION FOR MEASURING
SICAL PROPERTIES OF A LAKE,**
ell Aeronautical Lab., Inc., Buffalo, N.Y.
primary bibliographic entry see Field 02H.
-07882

**ACTIVATION ANALYSIS BY CHARGED PAR-
TICLES (IN SLOVAK),**
Slovak Technical Univ., Bratislava (C-
zechoslovakia); and Magyar Tudomanyos
Akademia Kozponti Fizikai Kutoto Intezete, Bu-
dapest.
Juraj Tolgyessy, Andras Salamon, and Elek Szabo.
Chemicke Listy, Vol 64, No 11, p 1121-1146,
1970. 6 fig, 7 tab, 189 ref.

Descriptors: *Nuetron activation analysis, *Analy-
sis, Nuclear physics, Analytical techniques, Deu-
terium, Tritium, Ions, Helium.
Identifiers: Cyclotron, Nuclear accelerators,
Neutron generators, Protons, Alpha-particles.

Advantages and shortcomings of activation
analyses employing charged particles are reviewed.
Particular attention is given to determination of
elements using bombardment by accelerated parti-
cles, including protons, deuterons, alpha-particles,
ions of tritium, and light helium. Stress is placed on
the optimum conditions for performance of nuclear
determinations and also the suitability of samples
for this method of analysis. The review is supple-
mented by examples of practical application of ac-
tivation analyses. (Wilde-Wisconsin)
W71-07886

**ON OPTIMUM CONDITIONS FOR UL-
TRASONIC SEPARATION OF DIATOMS OF
SANDY BENTHOS (IN FRENCH),**
Centre d'Oceanographie, Marseille (France). Sta-
tion Marine d'Endoume.
Michel Colocoloff, and Chantal Colocoloff.
Comptes Rendus Academie des Science, Paris,
Serie D, Vol 271, No 20, p 1794-1797, 1970. 1 tab,
9 ref.

Descriptors: *Analytical techniques, *Benthos,
*Ultrasonics, Measurement, Sands, Diatoms, Den-
sity, Sediments, Frequency, Sound waves.
Identifiers: Monasteriou Bay (France).

Identical samples of sandy benthos inhabited by
diatoms were dispersed ultrasonically using three
transmitters varying in power from 100 to 500 w
and in frequency from 20 to 30 kHz. Different
combinations of frequency, power, and duration of
the treatment produced dispersion of an enormous
range from about 22,000 to more than 1,000,000
cells per cu cm of sand. In part, this variation is due
to erosion of the samples, considerably greater at
low than at high frequencies. The results could also
be influenced by the shape of containers, nature
and volume of solution, and other conditions. Stan-
dardization of the method must be confined to
benthos samples of specific granulometric and
mineralogical composition. (Wilde-Wisconsin)
W71-07892

MICROWAVE EVAPOTRON,
National Oceanic and Atmospheric Administra-
tion, Boulder, Colo. Environmental Research Lab.
R. E. McGavin, P. B. Uhlenhopp, and B. R. Bean.
Water Resources Research, Vol 7, No 2, p 424-
428, Apr 1971. 5 p, 6 fig, 8 ref.

Descriptors: *Evaporation, *Instrumentation,
*Meteorology, *Meteorological data, *Data col-
lections, Weather data, Radar, Water vapor, Mass
transfer, Convection, Advection, Temperature.
Identifiers: *Microwave evaporimeter,
*Evaporimeters.

A microwave evapotron is described in which a
modified microwave refractometer and a vertical
sonic anemometer are combined to measure the
vertical transport of water vapor directly by the
eddy correlation method. The instrument was used
successfully in the field. Ten-minute samples from
this instrument compare favorably with the results
from conventional methods. In terms of evapora-
tion, the accuracy is within 0.02 cm/day, and the
resolution is within 0.002 cm/day. (Knapp-USGS)
W71-07915

**AN AUTOMATIC OUTFLOW MEASURING
DEVICE,**
Commonwealth Scientific and Industrial Research
Organization, Deniliquin (Australia). Riverina
Lab.
M. L. Sharma, and R. A. Bawden.
Water Resources Research, Vol 7, No 2, p 429-
431, Apr 1971. 3 p, 3 fig, 4 ref.

Descriptors: *Flow measurement, *Flowmeters,
*Discharge (Water), Instrumentation, Lysimeters,
Data collections, Flow rates, Gages.
Identifiers: Flowmeter (Automatic).

A device for continuous and accurate measure-
ment of very small quantities and slow rates of
water flow is described. Drops of uniform size are
formed and counted instantaneously by digital
counters as they fall between pairs of electrodes.
The counts and time are recorded by automatically
photographing the counters and a clock at suitable
time intervals. (Knapp-USGS)
W71-07917

**STEAM FILM SAMPLING OF WATER FOR
MASS SPECTROMETRIC ANALYSIS OF THE
DEUTERIUM CONTENT,**
Atomic Energy of Canada Ltd., Chalk River (On-
tario). Chalk River Nuclear Labs.; and Atomic
Energy of Canada Ltd., Chalk River (Ontario).
General Chemistry Branch.
For primary bibliographic entry see Field 02K.
W71-07918

**SEISMIC INVESTIGATION OF ICE PROPER-
TIES AND BEDROCK TOPOGRAPHY AT THE
CONFLUENCE OF THE NORTH AND CEN-
TRAL ARMS OF THE KASKAWULSH GLACI-
ER,**
Ohio State Univ., Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 02C.
W71-07955

OPTICAL MEASUREMENTS ON SNOW,
Army Cold Regions Research and Engineering
Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W71-07958

**REMOTE SENSING OF LUMINESCENT
MATERIALS,**
Geological Survey, Washington, D.C.; and Perkin-
Elmer Corp., Norwalk, Conn.
William R. Hemphill, George E. Stoertz, and David
A. Markle.
Proceedings 6th International Symposium on
Remote Sensing of Environment, Michigan Univer-
sity, Ann Arbor, October 13-16, 1969, Vol 1, p
565-585, 1970. 21 p, 21 fig, 30 ref.

Descriptors: *Fluorescence, *Remote sensing,
*Tracking techniques, Tracers, Fluorometry, Dye
releases, Path of pollutants, Oily water, Air pollu-
tion, Pollutant identification, Spectroscopy.
Identifiers: Fraunhofer-line discriminator.

A prototype Fraunhofer-line discriminator, suita-
ble for aircraft operation, was built and tested using
Rhodamine WT, a luminescent dye used as a tracer
in studies of current dynamics in rivers and estua-
ries. Results of tank, shipboard, and helicopter tests
show that the instrument responds to dye concen-
trations as small as 1 ppb, and suggest that a Fraun-
hofer-line discriminator should be operationally
useful in time-of-travel and dispersion studies.
Design modifications permit use of the Fraunhofer-
line discriminator in detecting natural lu-
minescence of oil seeps and spills, some water and
atmospheric pollutants, and other materials. (K-
napp-USGS)
W71-07961

HYDROLOGIC COMMUNICATIONS EXPERIMENT ON THE APPLICATIONS TECHNOLOGY SATELLITE (ATS-1),
Environmental Science Services Administration, Silver Spring, Md.
Allen F. Flanders, Francis V. Kohl, and Thomas W. Davis.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 1, p 197-204, 1970. 8 p, 2 fig, 2 tab, 1 ref.

Descriptors: *Telemetry, *Data transmission, *Satellites (Artificial), Hydrologic data, Data collections, Monitoring, Streamflow forecasting, Data storage and retrieval.
Identifiers: Hydrologic data transmission.

In a combined ESSA/NASA experiment, hydrologic data relay and equipment configuration testing was conducted via the VHF transponder on board the geostationary NASA Applications and Technology Satellite (ATS-1). Digital river and rainfall data were transmitted from hydrologic platforms in Arkansas, California, and Oregon upon satellite relayed interrogation by the NASA Command and Data Acquisition (CDA) station at Mojave, California. The data messages, relayed through the satellite, were recorded at Mojave, and transmitted to the Weather Bureau's Office of Hydrology in Silver Spring, Md., for teleprinter readout. Costs for a system of national scope appear commensurate with conventional ground systems when incorporated as part of a satellite vehicle performing other functions. The communications equipment required for the hydrologic ground sensors is estimated to be about $5,000 per site. (Knapp-USGS)
W71-07962

APPLICATION OF COMPUTER PROCESSED MULTISPECTRAL DATA TO THE DISCRIMINATION OF LAND COLLAPSE (SINKHOLE) PRONE AREAS IN FLORIDA,
Geological Survey, Tampa, Fla.; and Michigan Univ., Ann Arbor. Infrared and Optics Lab.
A. E. Coker, R. Marshall, and N. S. Thomson.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 1, p 65-77, 1970. 13 p, 6 fig, 1 tab, 9 ref. NASA Contract No R-146-09-020-011.

Descriptors: *Land subsidence, *Remote sensing, *Aerial photography, *Sinks, *Florida, Infrared radiation, Vegetation effects, Hydrogeology, Topography, Temperature, Water levels, Water level fluctuations, Subsidence, Withdrawal, Karst.
Identifiers: *Sinkhole collapse.

Near Bartow, Florida, data were collected for the purpose of studying land collapse phenomena using remote sensing techniques. The multispectral scanner system recorded 18 spectral bands ranging from 0.4 to 14.0 microns, and several types of photography were used. Because areas prone to active sink collapse often are not detectable from apparent surface expression prior to actual collapse, it was necessary to apply indirect methods to the problem of detecting the surface effects caused by water pressure decline in the areas of active sinkhole development. An experiment was conducted to collect and process data for the purpose of testing the hypothesis that areas of active sinks could be detected at the land surface from the integrated effects of water loss at depth on vegetation physiology and terrain temperature. The multispectral data were processed on an analog computer to detect moisture-stressed vegetation and surface temperatures. The results were printed on film to show the patterns of the hydrogeologic indicators. Terrain temperature patterns when compared with moisture-stressed vegetation patterns, show distinctive patterns which correlate with areas of known sinkhole activity in the Bartow area. (Knapp-USGS)
W71-07963

DIRECT DETERMINATION OF THE ELECTROMAGNETIC REFLECTION PROPERTIES OF SMOOTH BRACKISH WATER TO THE CONTINUOUS SPECTRUM FROM 10 TO THE 8TH POWER TO 4 x 10 TO THE 9TH POWER HERTZ,
Hawaii Univ., Honolulu. Water Resources Research Center.
Larry K. Lepley.
PhD Thesis in Geosciences - Geophysics, Dec 1970. 115 p, 50 fig, 46 ref. OWRR Project B-015-HI(1).

Descriptors: *Remote sensing, Brackish water, Electromagnetic waves, *Radar, *Salinity, Estuaries, *Hawaii, Springs, Roughness (Hydraulic), Waves, Geophysics, *Chlorinity.
Identifiers: Radio spectrum, Microwave spectrum, Aerial techniques, Reflectance.

A preliminary study of the electromagnetic properties of aqueous sodium chloride, computer-generated frequency dispersion curves of (1) the dielectric coefficients, (2) power reflectance, (3) brightness temperature, and (4) skin depth of water as a function of eight different normalities of sodium chloride corresponding to a salinity range from pure to ocean water, and as a function of five different temperatures from 0C to 40C to the radio frequency range from 10 to the 6th power to 3 x 10 to the 10th power Hertz were constructed. These graphs indicate that the frequency dispersion of the reflectance of radio energy in the 10 to the 6th power to 10 to the 9th power Hertz band at normal incidence to a smooth water surface is strongly influenced by the salinity of the water, and that the spectral signature could be used as a measure of water salinity as distinguished from water temperature. Reflectance spectra from 2.5 x 10 to the 9th power to 4.0 x 10 to the 9th power Hertz of fresh and sea water were obtained with a free-wave (horn antenna and pool) system and reflectance spectra of brackish and sea water from 10 to the 8th power to 2.0 x 10 to the 9th power Hertz and of fresh water from 0.8 x 10 to the 9th power to 2 x 10 to the 9th power Hertz were obtained with a coaxial waveguide system. The measured spectral signatures appear to agree with the computed reflectance of aqueous sodium chloride solutions. The theoretical and experimental results indicate that free-wave radio reflectance spectrometry from 10 to the 6th power to 10 to the 9th power Hertz is feasible for use in remote sensing of salinity of fresh and brackish water outflows onto sea water.
W71-07974

DETERMINATION OF THE ACTIVITY OF HETEROTROPHIC MICROFLORA IN THE OCEAN USING C-14-CONTAINING ORGANIC MATTER,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
For primary bibliographic entry see Field 05C.
W71-08042

APPLICATION OF AN ACOUSTIC STREAMFLOW-MEASURING SYSTEM ON THE COLUMBIA RIVER AT THE DALLES, OREGON,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02E.
W71-08056

THERMAL MAPPING OF STREAMS FROM AIRBORNE RADIOMETRIC SCANNING,
Purdue Univ., Lafayette, Ind. Dept. of Geosciences; and Purdue Univ., Lafayette, Ind. Lab. for Application of Remote Sensing.
B. Houston Atwell, R. B. MacDonald, and Luis A. Bartolucci.
Water Resources Bulletin, Vol 7, No 2, p 228-243, Apr 1971. 16 p, 8 fig, 1 tab, 6 ref. NASA Grant NGR 15-005-112; USDA Contract 12-14-100-10292.

Descriptors: *Remote sensing, *Water temperature, Solar radiation, Infrared radiation, Data collections, Data processing.
Identifiers: Thermal mapping.

A brief review of radiation theory is applied water temperature determinations. Errors troduced in radiant temperature measurements d to nonblackness of the water surface and the fects of the atmosphere are included in this discu sion. An airborne scanner system and analysis a display of scanner data using the Laboratory Applications of Remote Sensing (LARS) displ system are discussed. Thermal maps of four se tions of the Wabash River are used as examples the system's output, and points of interest of ea map are discussed. (Knapp-USGS)
W71-08061

AIRCRAFT GAMMA-RAY SURVEY OF SNO COVER,
Hydrometeorological Service of the USS Moscow.
A. V. Dmitriev, R. M. Kogan, M. B. Nikiforov, a Sh. D. Fridman.
Nordic Hydrology, Vol 2, No 1, p 47-56, 1971. p, 2 fig, 2 tab, 5 ref.

Descriptors: *Snow surveys, *Remote sensi *Gamma rays, *Nuclear moisture meters, *Wa equivalent, Radioactivity techniques, Surve Data collections, Instrumentation, Aircraft, Sno packs, Snow cover, Calibrations.
Identifiers: Snow mapping.

The physical basis for and the various methods measuring the water equivalent of the snow co by means of gamma-rays survey from aircraft discussed. The gamma radiation from natu radionuclides in the soil does not vary with t and by measuring the absorption of this radiat by the snow cover the water equivalent of the sn can be determined. The attenuation of the gam radiation depends only on the total mass of wa It does not depend on the state of the wa whether snow, ice or melt water. The gamma-field does depend however on the soil moist content in the top 30 cm to some extent. perience shows that the average water equival of the snow cover over large areas can be de mined with satisfactory accuracy with the gam ray survey method from an aircraft, and that results are in fact more reliable than conventio snow surveys on the ground. This is due to the that the small irregularities in the snow cover ar a large extent evened out when measured from air. (Knapp-USGS)
W71-08085

FIELD DETERMINATION OF BACTERIAL U APPEARANCE IN SEAWATER,
Technical Univ. of Denmark, Lyngby. Dept Sanitary Engineering.
For primary bibliographic entry see Field 05A.
W71-08160

7C. Evaluation, Processing and Publication

REDUCING EXCESS READOUTS FR DIGITAL STREAMFLOW RECORDERS,
Rocky Mountain Forest and Range Experime Station, Tempe, Ariz. Hydrology Lab.
Alden R. Hibbert, and Wilson B. Casner.
Water Resources Research, Vol 7, No 2, p 418, Apr 1971. 4 p, 2 fig, 1 ref.

Descriptors: *Data processing, *Stream ga *Data collections, *Computer programs, *Hy graphs, Water levels, Water level fluctuat Stage-discharge relations.
Identifiers: *Streamflow recorders.

Digital water level recorders on small, fl streams are frequently set at 5-minute readou tervals to define fluctuations during critical s flow periods. Consequently, during nons periods far more data points are punched on recorder tapes than are needed to define the

hydrograph. A two-step reduction process inates more than 95% of the original 105,000 points per year of record. The first reduction is ined by translating to IBM cards only every th (hourly) head value punched on the tape ng nonstorm periods. Storm periods are trans- at 5-minute intervals. A computer reduction on both hourly and 5-minute data then syste- cally rejects head values not essential to hydro- h definition. Rejection is based on differences evation and slope between successive head s. Computer output consists of cards and a g of the reduced data. (Knapp-USGS)
-07914

ODS IN PATILLAS-MAUNABO AREA, RTO RICO,
ogical Survey, Washington, D.C.
am J. Haire.
sale by US Geological Survey, Washington, 20242, Price $1.00. Geological Survey ologic Investigations Atlas HA-445, 1 sheet, Text, 5 fig, 1 map, 1 photo, 5 ref.

riptors: *Floods, *Puerto Rico, Profiles, -discharge relations, Flood damage, Maps, ping, Flood plains, Rainfall-runoff relation- , Hydrograph analysis, Depth-area-duration sis, Planning, Zoning, Coastal plains.
ifiers: Patillas (PR), *Maunabo (PR), ologic atlas.

one-sheet hydrologic atlas is one of a series of that covers the south coast of Puerto Rico een Ponce and Maunabo. This atlas shows the r-surface profiles and areas inundated by the ber 1970 flood and contains information per- g to previous floods that are hydrologically icant. The report has been prepared to pro- a technical basis on which individuals, or- ations, and governmental agencies can make ions leading to development on the flood plain patible with the degree for flood risk. Floods rred on most streams in Puerto Rico during eriod October 5-10, 1970. The greatest floods rred in the eastern two-thirds of Puerto Rico. floods of October 1970 were outstanding ise of their duration and multiple peaks. The ne of runoff was extraordinarily large. The s resulted from rainfall that totaled as much as ches at some places during the 6-day period. rainfall came mostly in intense bursts. The r streams of the southern slope rise on the illera Central, which is primary drainage di- of Puerto Rico. The channels are very steep in nountains, and their slopes become progres- less steep in the roothills and on the coastal (Knapp-USGS)
07926

UNDWATER HYDROLOGY OF THE CALERO APACHE INDIAN RESERVA- , SOUTH-CENTRAL NEW MEXICO,
gical Survey, Washington, D.C.
Sloan and M. S. Garber.
ale by US Geological Survey, Washington, 20242, Price 75 cents. Geological Survey ologic Investigations Atlas HA-349, 1 sheet, Text, 2 fig, 4 map, 2 tab, 7 ref.

riptors: *Water resources development, ndwater, *Hydrogeology, *Withdrawal, Mexico, Water wells, Hydrologic data, ers, Aquifer characteristics, Water levels, r yield, Water quality, Chemical analysis, pitation (Atmospheric), Drainage, Climatolo-

ifiers: *Groundwater resources (N. Mex).

ndwater hydrology of the Mescalero Apache n Reservation, South-Central New Mexico is n by a one-sheet hydrologic atlas consisting of eralized geologic map and section, a map ng water levels and location of wells and gs, a map showing approximate distribution of pitation, an illustration showing a generalized graphic column, tables of chemical analyses of water from springs and wells, and a descriptive text. The Yeso Formation of Permain age is the most extensive aquifer in the reservation, with yields to wells from less than 1 gpm to more than 500 gpm. Total dissolved solids in water samples from the Yeso formation ranged from 358 to 2,210 mg/liter. Analyses of water from wells and springs on the Mescalero Reservation show dissolved solids content ranging from 358 mg/liter to 3,909 mg/liter. The water is generally of the calcium-magnesium sulfate or bicarbonate type with hardness generally ranging from 300 to 2,000 mg/liter. (Woodard-USGS)
W71-07927

GROUNDWATER RESOURCES OF WALSH COUNTY, NORTHEASTERN NORTH DAKOTA,
Geological Survey, Washington, D.C.
Joe S. Downey.
For sale by US Geological Survey, Washington, DC, 20242, Price $1.00. Geological Survey Hydrologic Investigations HA-431, 1 sheet, 1971. Text, 1 fig, 3 map, 2 tab, 6 ref.

Descriptors: *Water resources development, *Groundwater, *Hydrogeology, *Withdrawal, *North Dakota, Hydrologic data, Water wells, Aquifers, Aquifer characteristics, Water levels, Water yield, Water quality, Chemical analysis, Hydrographs.
Identifiers: *Groundwater resources, *Walsh County (ND).

This one-sheet (34 x 29 inches) hydrologic atlas consisting of illustrations, tables, maps, and a descriptive text summarizes groundwater resources in Walsh County in northeastern North Dakota. The county is almost entirely covered by glacial drift of till and glaciofluvial deposits ranging in thickness from about 300 feet in the eastern part of the county to about 30 feet in the western part. The largest and most productive glacial-drift aquifer is located near the city of Fordville, and is locally known as the Fordvilleaquifer. Four bedrock units supply water to wells in the Walsh County. The Pierre Shale yields from 1 to 5 gpm from fracture zones in the upper part of the formation. Wells tapping the Dakota Sandstone have been reported to yield as much as 500 gpm. Water from the Jurassic and Paleozoic bedrock formations is very saline and is unsatisfactory for most uses. Wells tapping the glacial-drift aquifers in Walsh County yield water with a wide range of chemical quality. (Woodard-USGS)
W71-07928

FLOODS IN SALINAS AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
William J. Haire.
For sale by US Geological Survey, Washington, DC, 20242, Price $1.00. Geological Survey Hydrologic Investigations Atlas HA-477, 1 sheet, 1971. Text, 4 fig, 1 photo, 1 map, 5 ref.

Descriptors: *Floods, *Puerto Rico, Profiles, Stage-discharge relations, Flood damage, Maps, Mapping, Flood plains, Rainfall-runoff relationships, Hydrograph analysis, Depth-area-duration analysis, Planning, Zoning, Coastal plains.
Identifiers: *Salinas (PR), Hydrologic Atlas.

This one-sheet hydrological atlas covers the south coast of Puerto Rico between Ponce and Maunabo. It shows the water-surface profiles and areas inundated by the October 1970 flood and contains information pertaining to previous floods that are hydrologically significant. Floods occurred on most streams during the period October 5-10, 1970. The greatest floods occurred in an area east of a line extending from Arecibo to Ponce, which is the eastern two-thirds of Puerto Rico. Higher floods have occurred in other years in some areas but the floods of October 1970 were outstanding because of their duration and multiple peaks. The floods resulted from rainfall that totaled as much as 35 in at some places during the 6-day period. Rainfall came mostly in intense bursts. The drainage area of Rio Nigua is about 53 sq mi at the mouth at Mar Caribe. Rio Nigua flows across one of the most distinctive alluvial fans on the south coast. There are small diversion structures in Rio Lapa and Rio Majada for irrigation and water supply, but their storage capacity is negligible. The profile for the flood of October 1970 is shown and the flooded area is delineated on the map. The flood of August 1956 was slightly higher than the 1970 flood. The September 1928 flood, however, was 1 to 1.5 meters higher than the 1970 flood in the upper part of the coastal plain. The peak discharge of Rio Lapa near the mouth during the flood of October 1970 was 7,300 cfs (cubic feet per second), an average of 737 cfs per square mile of drainage area. The peak discharge of Rio Majada near its mouth was 13,000 cfs, an average of 580 cfs per square mile. (Knapp-USGS)
W71-07929

WATER-RESOURCES RECONNAISSANCE OF A PART OF THE MATANUSKA-SUSITNA BOROUGH, ALASKA,
Geological Survey, Washington, D.C.
Alvin J. Feulner.
For sale by the US Geological Survey, Washington, DC, 20242, Price 50 cents. Geological Survey Hydrologic Investigations Atlas HA364, 1 sheet, 1971. Text, 5 fig, 3 map, 2 tab, 3 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Hydrogeology, *Alaska, Streamflow, Runoff, Aquifers, Aquifer characteristics, Water yield, Water levels, Water quality, Chemical analysis, Precipitation (Atmospheric), Hydrologic data, Water wells, Withdrawal, Surface-groundwater relationships.
Identifiers: *Water resources (Alas).

This one-sheet hydrologic atlas consisting of maps, graphs, tables of data, and a descriptive text summarizes the groundwater and surface water resources of the Matanuska-Susitna Borough, Alaska. Average cumulative discharge of all measured streams in the study area was about 28,000 cfs. The greatest yields of groundwater (more than 100 gpm) comes from wells in the flood plains and lowland areas adjacent to streams and rivers. These areas are underlain by glacial and alluvial deposits of sand and gravel. Groundwater in the study area has a greater chemical-quality variation than the surface water. It generally is harder than surface water, except in areas adjacent to streams where the water quality of both is similar. Much of the groundwater obtained from shallow wells drilled in the alluvium contains objectionable concentrations of iron, most of which could be easily removed by aeration and filtration of the water prior to storage or use. Groundwater ranges from about 50 to more than 200 mg/liter in hardness and is of the calcium bicarbonate type. (Woodard-USGS)
W71-07930

FLOODS IN GUAYAMA AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
William J. Haire.
For sale by US Geological Survey, Washington, DC, 20242, Price $1.00. Geological Survey Hydrologic Investigations Atlas HA-446, 1 sheet, 1971. Text, 7 fig, 1 map, 1 tab, 5 ref.

Descriptors: *Floods, *Puerto Rico, Profiles, Stage-discharge relations, Flood damage, Maps, Mapping, Flood plains, Rainfall-runoff relationships, Hydrograph analysis, Depth-area-duration analysis, Planning, Zoning, Coastal plains.
Identifiers: *Guayama (PR), Hydrologic atlas.

This one-sheet hydrologic atlas is one of a series of four that covers the south coast of Puerto Rico between Ponce and Maunabo. This atlas shows the water-surface profiles and areas inundated by the October 1970 flood and contains information pertaining to previous floods that are hydrologically significant. The report has been prepared to provide a technical basis on which individuals, organizations, and governmental agencies can make

decisions leading to development on the flood plain compatible with the degree of flood risk. Floods occurred on most streams in Puerto Rico during the period October 5-10, 1970. The greatest floods occurred in the eastern two-thirds of Puerto Rico. The floods of October 1970 were outstanding because of their duration and multiple peaks. The volume of runoff was extraordinarily large. The floods resulted from rainfall that totaled as much as 35 inches at some places during the 6-day period. The rainfall came mostly in intense bursts. (Knapp-USGS)
W71-07931

FLOODS IN SANTA ISABEL AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
William J. Haire.
For sale by US Geological Survey, Washington, DC, 20242, Price $1.00. Geological Survey Hydrologic Investigations Atlas HA-448, 1 sheet, 1971. Text, 7 fig, 1 map, 2 photo, 5 ref.

Descriptors: *Floods, *Puerto Rico, Profiles, Stage-discharge relations, Flood damage, Maps, Mapping, Flood plains, Rainfall-runoff relationships, Hydrograph analysis, Depth-area-duration analysis, Planning, Zoning, Coastal plains.
Identifiers: *Santa Isabel (PR), Hydrologic atlas.

This one-sheet hydrological atlas is one of a series of four that covers the southern coast of Puerto Rico between Ponce and Maunabo. This atlas shows the water-surface profiles and areas inundated by the October 1970 flood and contains information pertaining to previous floods that are hydrologically significant. The report has been prepared to provide a technical basis on which individuals, organizations, and governmental agencies can make decisions leading to development on the flood plain compatible with the degree of flood risk. Floods occurred on most streams in Puerto Rico during the period October 5-10, 1970. The greatest floods, however, occurred in the eastern two-thirds of Puerto Rico. The floods of October 1970 were outstanding because of their duration and multiple peaks. The volume of runoff was extraordinarily large. The floods resulted from rainfall that totaled as much as 35 inches at some places during the 6-day period. The rainfall came mostly in intense bursts. A profile of the flood of October 1970 is shown. (Knapp-USGS)
W71-07932

HYDROLOGICAL FORECASTS AND MODERN COMPUTERS,
Gidromtcorologicheskii Nauchno-Inssledovatelsii Tsentr, Moscow (USSR).
For primary bibliographic entry see Field 04A.
W71-07948

COMPUTER SIMULATION OF CLINCH MOUNTAIN DRAINAGE NETWORKS,
IBM Thomas Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 04A.
W71-07952

COST OF MUNICIPAL SEWAGE TREATMENT PLANTS IN ILLINOIS,
Illinois State Water Survey, Urbana.
Thomas A. Butts, and Ralph L. Evans.
State of Illinois, Department of Registration and Education Circular 99. 37 p, 16 fig, 12 tab, 5 ref.

Descriptors: *Comparative costs, Least squares method, *Regression analysis, *Waste water treatment, Water quality control, *Illinois, *Cost analysis, Construction costs, Maintenance costs, Operating costs, Trickling filters, Lagoons, Activated sludge, Digestion, Sludge, Costs, *Sewage treatment.
Identifiers: Municipal waste water.

Municipal sewage treatment facility costs for 291 plants constructed in Illinois between 1957 to 1968 are summarized. The eight categories of new plants analyzed are: (1) lagoons, (2) primary with heated digesters' (3) primary with vacuum filters' (4) trickling filter-digester; (5) trickling filter-Imhoff tank; (6) activated sludge, constructed in place, having population equivalents (P.E.) equal to or less than 10,000; (7) activated sludge, constructed in place, having a P.E. of greater than 10,000; and (8) factory built activated sludge units. Mean unit treatment costs in dollars/P.E. were obtained using the least squares regression analysis, considering construction, operating and land costs in the general geometric form of C — KPn, where C is either construction, operating, or land costs, K is a regression constant, P is the sewage treatment design capacity, and n is the slope of the least squares regression line. Two categories were also established for plant additions, namely trickling filter or activated sludge additions. The regression equation formulated for additions was of the form C — KPnSm, where C— cost of the addition, K— a regression constant, P— capacity of new addition, S— capacity of existing plant, and n,m& slope constants. Several examples of the applications of the preceding equations were included, along with a table which summarized the relative costs predicted through use of the equations. This cost analysis procedure was not designed to replace an in-depth engineering study for determining costs. However, use of the formulae presented will allow concerned parties to obtain a quick estimate of the relative costs of the various treatment schemes. (Lowry-Texas)
W71-07994

EARTH RESOURCES RESEARCH DATA FACILITY INDEX: VOLUME I, DOCUMENTARY DATA; VOLUME II, SENSOR DATA.
National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center.

NASA Manned Spacecraft Center Publication MSC-02576 (2 Vols), Jan 1971. 506 p (Vol I); 219 p (Vol II).

Descriptors: *Data collections, *Information retrieval, *Resources, *Remote sensing, *Satellites (Artificial), Aerial photography, Bibliographies, Documentation, Publications, Natural resources.
Identifiers: *Earth Resources Data Index.

This document, presented in 2 volumes, is the cumulative issue of the Earth Resources Research Data Facility (ERRDF) Index. Volume I lists all Earth Resources Program documentary information that is available at the National Aeronautics and Space Administration's Manned Spacecraft Center. Included in Volume II of the Index are sensor data collected during flights over test sites and from missions flown by subcontractors supporting the Earth Resources Survey Program. The information cataloged in the 2 volumes of this document is divided into 5 major data catagories as follows: Vol. I, Part 1 - Technical documents and maps; Part 2 - Satellite data; Vol. II, Part 3 - Functional and check out data; Part 4 - Imagery data; and Part 5 - Electronic data. (Knapp-USGS)
W71-08046

FLOOD STAGES AND DISCHARGES FOR SMALL STREAMS IN TEXAS,
Geological Survey, Austin, Tex.
E. E. Schroeder.
Interim Report 85-4 (Geological Survey Texas District Open-file Report No 124), 1971. 319 p, 6 fig, 4 tab, 7 ref.

Descriptors: *Streamflow, *Floods, *Peak discharge, *Flow measurement, *Texas, Flow rates, Discharge (Water), Rainfall-runoff relationships, Stream gages, Gaging stations, Rain gages, Data collections, Hydrologic data, Small watersheds.

This report is the fourth in a series of interim reports that describe the objectives, planning of the project, the instrumentation, the progress and status of the project, and the data collected during the water year (Oct. 1, 1967-Sept. 30, 1968), for small streams (less than 20 square miles drainage area) in Texas. A typical installation consists of two crest-stage gages; one headwater gage, and one tail water gage. The headwater gage is located up stream from the culvert at a distance approximately equal to one culvert width in order to record the true water-surface elevation upstream from any drawdown-zone disturbance. The tailwater gage is located downstream from the culvert to record the water-surface elevation at the culvert outlet. The differential head, determined from the difference in the recorded headwater and tailwater peaks, is then converted into a peak rate of flow by standard U.S. Geological Survey methods of computation. Additional hydrologic data are obtained at each site by a stage and rainfall recorder. (Woodard-USGS)
W71-08047

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART II. PACIFIC SLOPE BASINS IN CALIFORNIA, VOL 2, BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Washington, D.C.

For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, Price $3.25. Geological Survey Water Supply Paper 1929, 1970. 673 p, 1 fig, 1 plate.

Descriptors: *Hydrologic data, *Data collection, *Streamflow, *Stream gages, *California, Surface waters, Flow rates, Average flow, Low flow, Peak discharge, Flow measurement, Reservoir stage, Lakes, Gaging stations, Discharge measurement.
Identifiers: *Pacific Slope Basins (Calif).

This volume of surface water supply for the Pacific Slope Basins in California from Arroyo Grande to Oregon stateline, except Central Valley, is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1961-65 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs, a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include discharge measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W71-08048

SURFACE WATER SUPPLY OF THE UNITED STATES, 1961-65: PART 12. PACIFIC SLOPE BASINS IN WASHINGTON, VOL. 1. PACIFIC SLOPE BASINS IN WASHINGTON EXCEPT COLUMBIA RIVER BASIN.
Geological Survey, Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price $3.50. Geological Survey Water Supply Paper 1932, 1971. 679 p, 1 fig, 1 plate.

Descriptors: *Streamflow, *Hydrologic data, *Data collections, *Stream gages, *Washington, Surface waters, Discharge measurement, Flow rates, Average flow, Low flow, Peak discharge, Gaging stations, Reservoir stages, Lakes.
Identifiers: *Pacific Slope Basins (Wash).

This volume of surface water supply for Pacific Slope Basins in Washington, except Columbia Basin, is one of a series of 37 reports presenting records of stage, discharge, and content of strea

s, and reservoirs in the United States during the -65 water years. The tables of data include a ription of the gaging station, and daily, thly, and yearly discharges of the stream. The ription of the station gives the location, nage area, records available, type and history ge, average discharge, extremes of discharge, general remarks. For most gaging stations on and reservoirs, a description of the station a monthly summary table of stage and contents iven. Data for partial-record stations include arge measurements at low-flow partial-record ns, and annual maximum stage and discharge st-stage stations. (Woodard-USGS)
-08049

IONWIDE STUDY OF THE STREAMFLOW A PROGRAM,
ogical Survey, Washington, D.C.
Carter, and M. A. Benson.
r Resources Bulletin, Vol 7, No 2, p 383-385, 1971. 3 p, 1 tab.

riptors: *Data collections, *Hydrologic data, ing stations, Reviews, Surveys, Data essing, Instrumentation, Networks, Evalua- Performance, Planning.
ifiers: US Geological Survey, *Streamflow programs.

ng 1970 the Geological Survey conducted a to evaluate the surface-water data collection am. Objectives were formulated, specific were set, a massive analysis of available data made to determine the extent to which the nt system enables the goals to be met, alterna- were considered for meeting the remaining , and finally, specific elements were identified clusion in the future program. The results of valuation are used in planning the streamflow program. Less productive elements in the nt program can be weeded out, and the effort ed to more critically needed water data. The provides the groundwork for direction of ef- towards a more efficient system for satisfying nt and future needs. (Knapp-USGS)
-08059

MARY OF SNOW SURVEY MEASURE- TS FOR ARIZONA AND PERTINENT POR- S OF NEW MEXICO 1939-1970,
Conservation Service, Phoenix, Ariz.
rimary bibliographic entry see Field 02C.
-08076

CTED WATER RESOURCE RECORDS OKALOOSA COUNTY AND ADJACENT AS,
gical Survey, Tallahassee, Fla.
s B. Foster, and Charles A. Pascale.
la Bureau of Geology Information Circular 7, 1971. 95 p, 4 fig, 9 tab, 9 ref.

riptors: *Surface waters, *Groundwater, rologic data, *Data collections, *Florida, r resources, Rainfall, Stream gages, Chemical sis, Water temperature, Water wells, Water , Pumping, Geology, Petrology, Hydrogeolo- quifer characteristics, Aquifers, Hydrology.
ifiers: *Okaloosa County (Fla), Lithologic Streamflow measurements.

r resources records are presented for osa County, Florida, the upper drainage area al River, coastal areas in Walton County, and ed areas in Santa Rosa County. These records collected from January 1966 through Sep- r 1968. Geologic and hydrologic information resented in tables which group the data ac- ng to type. Maps of the area show the location ta collection stations within the county and ent areas. The tabulated surface-water data le station numbers, streamflow measure- s, chemical analyses, and water temperatures. ndwater records include wells inventoried, levels, pumpage, chemical analyses, water temperatures, and lithologic logs. Rainfall data are compiled, and the location of the rain gages are shown. (Woodard-USGS)
W71-08114

LOW-FLOW FREQUENCY OF WISCONSIN STREAMS,
Geological Survey, Washington, D.C.
Warren A. Gebert.
For sale by US Geological Survey, Washington, DC, 20402, Price $0.75 cents. Geological Survey Hydrologic Investigations Atlas HA-390, 1 sheet, 1971. Text, 3 fig, 1 map, 14 ref.

Descriptors: *Streamflow, *Low flow, *Frequency analysis, *Wisconsin, Stream gages, Flow characteristics, Discharge measurement, Gaging stations, Hydrographs, Water resources development, Base flow.
Identifiers: *Low-flow variability.

This one-sheet hydrologic atlas presents low-flow characteristics at 320 streamflow stations in Wisconsin. Knowledge of the magnitude and frequency of recurrence of low flows of streams is useful for planning, managing, and protecting the State's water resources. Planning and regulatory agencies can use low-flow frequency information for allocating water rights, administering water uses, developing water projects, and determining the availability of water. Industries and municipalities can use the information in seeking water supplies, as well as in determining the capacities of streams to dilute wastes. (Woodard-USGS)
W71-08115

SELECTED FLOW CHARACTERISTICS OF FLORIDA STREAMS AND CANALS,
Geological Survey, Tallahassee, Fla.
Richard C. Heath, and E. Turner Wimberly.
Florida Bureau of Geology Information Circular No 69, 1971. 595 p, 7 fig, 8 ref.

Descriptors: *Streamflow, *Flow characteristics, *Stream gages, *Hydrologic data, *Florida, Data collections, Discharge measurement, Low flow, Peak discharge, Duration curves, Average flow, Gaging stations, Reviews.
Identifiers: *Streamflow basic data (Fla).

Tables of flow duration, lowest mean discharge, and highest mean discharge for selected consecutive periods within each year through September 30, 1965, at 254 stream-gaging stations on Florida streams are presented. These tables summarize daily streamflow records needed to define flow characteristics at stream-gaging sites. The content of each of the three summary tables is described, and techniques for preparing flow-duration curves, and low-flow and high-flow frequency curves are explained. (Woodard-USGS)
W71-08119

08. ENGINEERING WORKS

8A. Structures

OPERATING FORCES ON MITER-TYPE LOCK GATES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07782

SPILLWAY FOR TYPICAL LOW-HEAD NAVIGATION DAM ARKANSAS RIVER, ARKANSAS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07783

PROTECTION OF NARRAGANSETT BAY FROM HURRICANE SURGES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07784

SPILLWAY FOR OAHE DAM MISSOURI RIVER, SOUTH DAKOTA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07785

WAVE ACTION AND BREAKWATER LOCATION, HALF MOON BAY HARBOR, HALF MOON BAY, CALIFORNIA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07786

NAVIGATION CONDITIONS AT MAXWELL LOCKS AND DAM, MONONGAHELA RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07787

SPILLWAY, MILLERS FERRY LOCK AND DAM, ALABAMA RIVER, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07788

SPILLWAY FOR PROCTOR DAM, LEON RIVER, TEXAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07790

EFFECTS ON LAKE PONTCHARTRAIN, LA., OF HURRICANE SURGE CONTROL STRUCTURES AND MISSISSIPPI RIVER-GULF OUTLET CHANNEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07791

TYPICAL SPILLWAY STRUCTURE FOR CENTRAL AND SOUTHERN FLORIDA WATER-CONTROL PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07792

SPILLWAY MODIFICATIONS, MIRAFLORES DAM, PANAMA CANAL ZONE: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07798

SPILLWAY FOR STOCKTON DAM, SAC RIVER, MISSOURI: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-07799

WASHED OUT ROAD REOPENED QUICKLY.

Public Works, Vol 101, No 8, p 84, Aug 1970. 3 fig.

Descriptors: *Construction, *Steel pipes, *Installation, *Construction materials.

This article describes how a concrete slab deck culvert, destroyed by a flash flood, was replaced in only eleven working days with two 90-inch corrugated galvanized steel pipes. The contractor laid the pipe employing all standard practices except for the special borrow gravel used for the entire fill. It is normally used only halfway up the pipe.
W71-07857

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN NEW JERSEY.
Corps of Engineers, New York. North Atlantic Div.
For primary bibliographic entry see Field 04A.
W71-07921

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN DELAWARE.
Corps of Engineers, New York. North Atlantic Div.
For primary bibliographic entry see Field 04A.
W71-07925

SNOW FENCES,
Road Research Lab., Crowthorne, England, Climate and Environment Section.
For primary bibliographic entry see Field 02C.
W71-08069

THE LAYOUT OF NEW NAVIGABLE WATERWAYS,
Administration des Ponts et Chausees, Paris (France).
Jean Aubert.
Bulletin of the Permanent International Association of Navigation Congresses (PIANC), Vol 4, No 6, p 17-39, 1970. 23 p, 17 fig, 6 tab, 3 append.

Descriptors: *Navigable waters, *Locks, *Hydraulic structures, *Navigation, *Inland waterways, Engineering structures, Canals, Tunnels, Ships, Costs, Hydraulic transportation, Planning.
Identifiers: *France.

New approaches to improving and increasing navigable waterways in France are discussed under the following topics: (1) Canalization of rivers; (2) Tunnels; (3) Locks and elevators; (4) Negotiation of a crest by a canal; and (5) Water slope. The estimated costs of constructing and maintaining the facilities are given. The value of shipping time is formulated on the basis of time lost by a ship passing through a lock. For example, with a traffic of 10 million tons per annum, after making allowance for unavoidable periods of waiting, the average time lost is 50 minutes for a lock with a 10 m fall. This figure varies by one minute more or less per meter according to whether the fall is greater or smaller. A ship's average load is 2,000 tons, and the number of ships passing through the lock in a year is 5,000. One hour of lost time suffered by a ship represents a loss of 200 francs. The annual loss for one hour's delay amounts to: 200 X 5,000 — 1,000,000 francs. The total time value per meter of fall for the various lock fall heights are shown. (Woodard-USGS)
W71-08120

SEISMIC ACTIVITY IN THE VICINITY OF SAN LUIS RESERVOIR,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 08D.
W71-08170

FEASIBILITY STUDY OF WATER IMPOUNDMENTS, MESCALERO APACHE INDIAN RESERVATION, SOUTH CENTRAL NEW MEXICO.
Boyle Engineering, Ventura, Calif.
For primary bibliographic entry see Field 06B.
W71-08172

THE USE OF SYSTEMS ANALYSIS IN THE DEVELOPMENT OF WATER RESOURCES MANAGEMENT PLANS FOR NEW YORK STATE,
New York State Department of Environmental Conservation, Albany. Div. of Water Resources.
A. C. Tedrow, C. S. Liu, D. B. Halton, and R. A. Hiney.
Available from the National Technical Information Service as PB-199 539, $3.00 in paper copy, $0.95 in microfiche. Vol I, June 1970. 183 p, 36 fig, 11 tab, 18 ref. OWRR Project C-1126 (No 1586) (1).

Descriptors: *Systems analysis, *Optimization, *Dynamic programming, *Simulation analysis, *Water management (Applied), Multiple-purpose projects, River basins, Flood control, Mathematical models, Computer programs, Water resources development, Operations research.
Identifiers: Oswego River Basin.

A research project was developed to evaluate the use of systems analysis techniques in New York State's multiple purpose comprehensive water resources planning program. In conjunction with an on-going planning study, hydrologic models were developed for evaluation of various management schemes. The Oswego River Basin, located in central New York, was used as the vehicle for carrying out the project. In applying systems analysis techniques to the river basin, a number of models were constructed. Management programs were analyzed on two different time bases; one, an overall budgeting or allocating of waters to various purposes on a long time interval and the other, the operation of the physical system on a transient basis during flood periods. As a result, a monthly or 'conservation' simulation model, a monthly optimization model, and a flood simulation model were developed. Dynamic programming was applied to optimize the diversion operations and Hook's pattern search method optimized the storage operations for the multiple purpose river system. The 'conservation' model simulated the hydraulic operation of the lakes and water courses outlines. The flood routing model was a mathematical representation of a hydraulic system and consisted of the lakes and reservoirs in the Oswego River Basin and their connecting waterways. The models provided an excellent framework for management of the planning study, specifying data needs, and priorities on development of information. (See also W71-08186) (Kriss-Cornell)
W71-08185

8B. Hydraulics

OPERATING FORCES ON MITER-TYPE LOCK GATES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Grace, Jr., T. E. Murphy, and F. R. Brown.
Available from the National Technical Information Service as AD-718 219, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-651, June 64. 130 p.

Descriptors: *Locks, *Gates, *Pressure, *Canels, Inland waterways.
Identifiers: Kinematics, Torque, Panama, Miter type lock gates.

Tests to determine the force required to move miter-type lock gates throughout the opening and closing cycles were conducted in a flume with a single set of miter gates located approximately in its center. Three linkages, with different kinematics of the operating machinery, were studied (modified Ohio River, Panama, and Ohio River). Other variables investigated were: submergence of gate; operating time; lock chamber length; bottom clearance of gate; barges in lock chamber; nonsynchronous operation of gate leaves. Peak hydraulic resistance to operation occurred as the leaves entered and left the closed position. The modified Ohio River and Panama linkages resulted in peak resistance in terms of torque at the pintle about equal and 40 percent less than those of the Ohio River linkage. Increased submergence of the leaves or speed of operation increased hydraulic resistance, as did decreases in gate bottom clearance. Hydraulic resistance decreased as lock chamber length increased. Nonsynchronous operation of the gates slightly reduced peak torque. Barges in the lock chamber had no effect on torque values. A report by the Panama Canal on earlier model tests of the Panama linkage is included as Appendix A. (WES)
W71-07782

SPILLWAY FOR TYPICAL LOW-HEAD NAVIGATION DAM ARKANSAS RIVER, ARKANSAS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Grace, Jr.
Available from the National Technical Information Service as AD-718 218, $3.00 in paper copy, $0.95 in microfiche. WES Technical report, 2-655, June 64. 162 p.

Descriptors: *Dams, *Model studies, *Flow, *Spillways, Concrete, Arkansas construction materials.
Identifiers: Arkansas River, Riprap.

Investigations were conducted using 1:25-, 1:40, and 1:50-scale section models to determine optimum gate sill and pier nose shapes, spillway capacity with full and partial gate openings for both free and submerged flows, stilling basin performance, and riprap requirements for a typical low-head navigation dam such as planned for construction on the Arkansas River. Test results indicated that: (a) the parabola, X2 — 4OY, is the optimum gate sill shape; (b) an ogival pier nose is slightly more efficient than a semicircular nose; (c) apron elevations in the range of elevations tested do not affect discharge characteristics; (d) one row of 4-ft-high baffle piers and a 3-on-4-sloping, 4-ft-high end sill comprise the optimum stilling basin; (e) riprap downstream of the stilling basin is most stable when placed on a slope of 1 on 6; and (f) extension of the gate piers from the toe of the gate to the end of the stilling basin produces a more uniform scour pattern in the exit channel. (WES)
W71-07783

PROTECTION OF NARRAGANSETT BAY FROM HURRICANE SURGES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons.
Available from the National Technical Information Service as AD-718 220, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-662, June 64. 122 p.

Descriptors: *Breakwaters, *Model studies, *Surges, *Ocean waves, Shore protection, Tides, Navigation, Barriers, Salinity.
Identifiers: Tropical cyclones, Ocean currents, Military requirements, Hurricane surge, Providence (RI), Waste wash-out.

The design of barriers for protection of Narragansett Bay against inundation by hurricane surges required use of a comprehensive model to determine the effects of proposed structures on normal tide and hurricane surge heights, current velocities, the salinity regimen of the bay, and the rates of diffusion and flushing of pollutants discharged into the bay. Model tests indicated that barriers should not be located in the central portions of the bay because of excessive buildup of surge he

ynstream from such barriers, that a lower bay rier alone could not satisfy the requirements of Navy and at the same time afford the desired uctions in surge heights at upstream locations, that the combination of a gated structure at Fox nt for the protection of Providence with a em of lower bay barriers with ungated openings ld satisfy the requirements of the Navy for max- m current velocities and at the same time pro- hurricane surge protection throughout the bay em. However, current velocities and patterns in ated navigation openings would not be safe for igation by all craft which use Narragansett Bay. addition of gated openings in the East and t Passage barriers should provide a satisfactory tion to this problem. Such a plan should have letrimental effects on the salinity regimen of the the rates and patterns of diffusion and flushing vastes, or on shoaling of the navigation chan- (WES)
1-07784

LLWAY FOR OAHE DAM MISSOURI ER, SOUTH DAKOTA,
y Engineer Waterways Experiment Station, csburg, Miss.
. Melsheimer, and A. D. Rooke, Jr.
ilable from the National Technical Information ice as AD-718 222, $3.00 in paper copy, $0.95 icrofiche. WES Technical report 2-657, Sept 42 p.

criptors: *Dams, *Model studies, *Flow, *Spill- s, Shallow water, Concrete, Missouri, Weirs.
tifiers: Oahe Dam, Missouri River, Riprap.

spillway, a low, broad-crested weir sur- nted by 8 gates, will be operated when the pool hes top-of-gate elevation; thus initial flows will harge into a dry exit channel under a 23.5-ft l. A 1:50-scale model was used to study spill- performance when this structure is the control supercritical flow predominates. A shallow -ft-deep), rectangular stilling basin was eloped which dispersed small flows and inated surface waves at large flows. Also a gate ration schedule was developed which, together the shallow basin, comprised the optimum hod of controlling flows on the apron nstream until submergence occurred. Tests of exit channel (a paved transition section and a ap-protected section leading to the unlined nnel) showed that sector walls could replace concrete transitions below the rectangular n, and that the paved apron and riprap section d be reduced in length. (WES)
1-07785

VE ACTION AND BREAKWATER LOCA- N, HALF MOON BAY HARBOR, HALF ON BAY, CALIFORNIA: HYDRAULIC DEL INVESTIGATION,
y Engineer Waterways Experiment Station, csburg, Miss.
. Wilson.
ilable from the National Technical Information ice as AD-718 678, $3.00 in paper copy, $0.95 icrofiche. WES Technical report 2-668, Jan 70 p.

criptors: *Breakwaters, *Model studies, ean waves, Test procedures, California, rography, Deep water.
tifiers: Half Moon Bay (Calif).

entire Half Moon Bay Harbor basin, the sur- ding breakwater system with 600-ft-wide gation entrance, and sufficient coastline and ore hydrography to ensure accurate simula- of approaching waves were reproduced in a 0-scale hydraulic model equipped with wave- rating and wave-height measuring devices. model was used to determine the optimum lo- on and length of breakwaters necessary to pro- at minimum cost, adequate protection for sure craft and fishing boats berthed at the piers ng storm wave action. It was concluded that an added section of rubble-mound breakwater about 1050 ft long, which would extend the existing west breakwater in a southeasterly direction and provide a revised navigation entrance about 350 ft wide, would ensure the desired protection. Alternate breakwater plans were developed that also satisfied the selected wave-height-duration criteria. However, these plans involved more costly structures or had some overriding objectionable feature not characteristic of the plan recommended for construction. (WES)
W71-07786

NAVIGATION CONDITIONS AT MAXWELL LOCKS AND DAM, MONONGAHELA RIVER: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and C. D. McKellar.
Available from the National Technical Information Service as AD-718 679, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-672 Jan 65. 73 p.

Descriptors: *Dams, *Model studies, *Navigation, *Locks, Test procedures, Pennsylvania, River flow.
Identifiers: Multiphase flow, Flow fields, Monongahela River.

Maxwell Locks and Dam will consist of two parallel, 84- by 720-ft locks and a 460-ft-long, gated, nonnavigable dam. A 1:120-scale, fixed-bed model, reproducing about 2.4 miles of the relatively straight reach of the Monongahela proposed for the locks and damsite, was used to: (a) determine the most favorable site in the reach for the structures; (b) demonstrate flow conditions in the lock approaches; (c) assist in developing modifications of the approaches and structures to improve navigation conditions; and (d) determine flow and navigation conditions during the stages of construction of the locks and dam. Tests were concerned with the study of flow patterns, measurement of velocities in the lock approaches, and behavior of a model tow on entering and leaving the locks under flows ranging from 35,000 to 116,000 cfs. The results of the investigation indicated the following: (a) the locks and dam should be constructed 600 ft farther downstream than originally designed to increase the distance between the bend and the lock approach; (b) ports will be required in the upper guard wall to reduce or eliminate the intensity of crosscurrents at the end of the wall; (c) a large eddy will form in the lower approach, but the intensity of the currents in the eddy should not be sufficient to seriously affect the movement of tows approaching the lock; and (d) dredging will be required along the left bank below the dam to eliminate the excessive contraction and backwater effects produced by an underwater prominence and to improve navigation conditions in the lower approach. (WES)
W71-07787

SPILLWAY, MILLERS FERRY LOCK AND DAM, ALABAMA RIVER, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. A. Pickering.
Available from the National Technical Information Service as AD-717 979, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 3-643, Feb 64. 63 p.

Descriptors: *Dams, *Model studies, *Spillways, Flow, Construction costs.
Identifiers: Millers Ferry Lock and Dam (Ala), Alabama River.

The model of the gated spillway, constructed to an undistorted scale of 1:50, reproduced one 50-ft-wide gate bay and approximately half of each adjacent gate bay. The general purpose of the model study was to determine the flow characteristics over the spillway and to verify the adequacy of the stilling basin design. Tests revealed that flow separated from the downstream face of the original gate sill and a parabolic shape was added in order to guide flow into the stilling basin. The spillway rating curves were determined with full and partial gate openings for both gate sill shapes. The stilling basin as originally designed functioned satisfactorily below the curved sill shape, but alterations were tested in an effort to reduce construction costs. The altered basins were not as efficient as the original design; therefore, the original design is recommended. (WES)
W71-07788

DESIGNS FOR RUBBLE-MOUND BREAKWATER REPAIR, KAHULUI HARBOR, MAUI, HAWAII,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Jackson.
Available from the National Technical Information Service as AD-717 980, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-644, Feb 64. 89 p.

Descriptors: *Breakwaters, *Model studies, *Harbors, Ocean waves, Concrete shore protection.
Identifiers: Protective coverings, Kahului Harbor, Maui (Hawaii), Rubble mound breakwater.

Tests were conducted on 1:68.5-scale models of breakwater sections to obtain data from which economical and stable designs could be developed for repair of the damaged breakwaters at Kahului Harbor. Proposed designs involved protective cover layers of 35and 50-ton tribar armor units. Design of the breakwater repair was difficult because of the large prototype design wave (34 ft high), the limited space between the concrete monoliths on the crowns of the existing breakwaters and the limits of the navigation channel and harbor basin, and the limited lifting capacity and horizontal reach of available construction equipment at Kahului. Repair designs were developed, for both east and west breakwaters, that would withstand the attack of the selected 34-ft prototype design wave. It was also determined that repairing the damaged portion of the west breakwater head would not cause damage to the undamaged portion of the head and trunk. (WES)
W71-07789

SPILLWAY FOR PROCTOR DAM, LEON RIVER, TEXAS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. S. Melsheimer, and T. E. Murphy.
Available from the National Technical Information Service as AD-717 981, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-645, Mar 64. 44 p.

Descriptors: *Dams, *Model studies, *Spillways, Pressure, Texas, Weirs.
Identifiers: Rivers, Procter Dam, Leone River.

The spillway will include a low weir with sloping upstream face and an ogee crest. The crest was designed for a head of 29 ft although heads up to 39 ft are expected. Tests were conducted in a 1:40-scale section model of the spillway to verify the adequacy of the proposed crest shapes with the upstream face of the weir on slopes of 3 on 2 and 3 on 3. Optimum pressure conditions and discharge coefficients were obtained with a crest shape which was tangent to the upstream face of the dam. (WES)
W71-07790

EFFECTS ON LAKE PONTCHARTRAIN, LA., OF HURRICANE SURGE CONTROL STRUCTURES AND MISSISSIPPI RIVER-GULF OUTLET CHANNEL,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
I. C. Tallant, and H. B. Simmons.
Available from the National Technical Information Service as AD-717 978, $3.00 in paper copy, $0.95

in microfiche. WES Technical Report 2-636, Nov 63. 113 p.

Descriptors: *Breakwaters, *Model studies, Flood control, Surges, Hurricanes, Drainage, Shore protection, Tides, Lakes, Louisiana, Gulfs, Salinity, Barriers, Inland waterways.
Identifiers: Tropical cyclone, Damage, Inland waterways, Lake Pontchartrain, New Orleans (La).

A system of barriers along the south shore and across the eastern end of Lake Pontchartrain has been proposed as a plan for protecting New Orleans from hurricane damage. A model study was conducted to determine the effect of these barriers and also that of the Mississippi River-Gulf Outlet Channel (now under construction) on the hydraulic and salinity regimen of Lake Pontchartrain and adjoining lakes. It was concluded that: (a) freshwater inflow must be given equal consideration with any plan for modification of the salinity regimen of the lake system; (b) the proposed control structures for Chef Menteur and Rigolets would have little adverse effect on salinities and tidal heights; (c) the connection of the Gulf Outlet Channel to Lake Pontchartrain will increase salinity in the lake such that a control structure will be required; (d) complete closure of all structures during a hurricane would not cause adverse salinity conditions or increase the high-water elevation by more than 1.4 ft msl; (e) operation of the Bonnet Carre Spillway at design flow with the Gulf Outlet Channel connected and hurricane structures installed in the passes would raise the high-water elevation to 1.4 ft msl. (WES)
W71-07791

TYPICAL SPILLWAY STRUCTURE FOR CENTRAL AND SOUTHERN FLORIDA WATER-CONTROL PROJECT,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Grace, Jr.
Available from the National Technical Information Service as AD-717 977, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-633, Sep 63. 69 p.

Descriptors: *Dams, *Model studies, *Flow, *Spillways, Drainage, Flood control, Florida.

A typical control structure, a low ogee spillway with vertical-lift gates, was studied on a 1:16-scale model to determine the effects on discharge characteristics of various approach and exit channel elevations under free and submerged, uncontrolled and controlled flows. Results indicated that the discharge characteristics for each type of flow can be satisfied by certain equations. The approach depth does not affect submerged-flow discharge coefficients, and approach depths greater than the design head do not appreciably affect free-flow coefficients. However, approach depths less than the design head do affect free-flow coefficients. Exit channel elevations affect uncontrolled flow more than controlled (almost no effect), and free more than submerged. There is a critical exit channel elevation at which the structure's efficiency in passing uncontrolled flows is greatly reduced. The test data do not permit a complete solution of the problem, but do afford a firmer basis for design. Additional model and field data are needed for a complete solution. (WES)
W71-07792

OUTLET WORKS, DEGRAY DAM, CADDO RIVER, ARKANSAS: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. R. Bucci.
Available from the National Technical Information Service as AD-718 683, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-684, Vicksburg, Miss, July 1965. 20 p, 21 photos, 32 plates.

Descriptors: *Dams, *Model studies, *Sluice gates, Test procedures, *Outlets, Flow, Pressure, *Stilling basins.
Identifiers: Arkansas, Caddo River, Degray Dam.

The model investigation of the single-tunnel outlet works was concerned with developing a stilling basin suitable for high diversion flows (up to 28,000 cfs) and high-energy flood-control releases (up to 6000 cfs). The 1:23-scale model reproduced the intake tower, tunnel, stilling basin, and exit channel. Both a slide-gate and a cylinder-gate intake tower were tested. The cylinder-gate tower operated with a lower head loss and with less tendency to cause surging than did the slide-gate tower. A stilling basin requiring minimum excavation and providing satisfactory energy dissipation of both diversion and flood-control releases was developed. (WES)
W71-07793

SPILLWAY FOR AMISTAD DAM, RIO GRANDE, MEXICO AND UNITED STATES. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. L. Grace, Jr.
Available from the National Technical Information Service as AD-718 223, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-653, Aug 64. 98 p.

Descriptors: *Dams, *Model studies, Concrete, Soils, Foundations, Spillways, Stilling basins, Abutments, Walls, Drainage, Hydrostatic pressure.
Identifiers: Altitude, Amistad Dam, Rio Grande River, Weirs.

This report presents the results of tests conducted on a 1:70-scale section model reproducing one-half of the spillway for Amistad Dam, a combination concrete gravity and earth embankment structure rising 253 ft above the bed of the Rio Grande. The spillway consists of an ogee crest controlled by 16 tainter gates, 50 ft wide and 54 ft high, and a hydraulic jump type stilling basin. The spillway will be flanked on each side by a powerhouse. Discharge characteristics of the spillway, hydrostatic pressures on the ogee weir crest, lateral pressures on the gate piers, performace of both single- and double-stage stilling basins at various elevations, and the height and length of both spray and stilling basin training walls were investigated. The theoretical spillway rating curve and the expected hydrostatic pressures on the weir crest were in close agreement with those determined with the model. Stilling basin performance of the original design was found to be unsatisfactory. However, satisfactory stilling basin designs were developed for three apron elevations. The height of the original spray wall was found to be inadequate due to the effect of the abutment on the water-surface profile. The original height and length of the stilling basin training walls were found to be the optimum. (WES)
W71-07794

SELECTION OF OPTIMUM PLAN FOR REDUCTION OF WAVE ACTION IN MARINA DEL REY, VENICE, CALIFORNIA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. W. Brasfeild.
Available from the National Technical Information Service as AD-718 684, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-671, Vicksburg, Miss, Jan 1965. 21 p, 6 tab, 20 photos, 16 plates.

Descriptors: *Breakwaters, *Model studies, Ocean waves, Tides, California, Test procedures.
Identifiers: Ocean models, Marina del Rey, Venice (Calif).

A 1:75-scale model, molded in concrete, was used to develop an optimum plan of improvement for reducing wave heights to a satisfactory level within the harbor of Marina del Rey. The marina consists of a 2-mile-long channel and eight lateral basins. The model reproduced the entire harbor and enough of adjacent Santa Monica Bay to allow propagation of the required test waves. A 40-ft long wave machine and electrical wave-height measuring and recording apparatus were utilized in model operation. It was concluded from test results that a 2325-ft-long, wing-type, offshore rubble mound breakwater in front of the harbor entrance offered greater protection to the entire harbor area than any of the other plans tested. Although other plans were developed which furnished adequate protection to the individual basins, they were not as efficient as the breakwater in reducing wave heights in the harbor entrance and main channel. (WES)
W71-07796

FILLING AND EMPTYING SYSTEM JONESVILLE LOCK, QUACHITA-BLACK RIVERS, LOUISIANA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. R. Oswalt, J. H. Ables, Jr., M. B. Boyd, and T. E. Murphy.
Available from the National Technical Information Service as AD-718 681, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-671, Vicksburg, Miss, June 1965. 25 p, 16 tabs, 16 plates.

Descriptors: *Dams, *Model studies, *Locks, *Flow control, Vortices, Louisiana, River flow, Intakes, Outlets.
Identifiers: Water entry, Black River, Quachita River.

The filling and emptying system of the 600- by 84-ft Jonesville Lock will consist of wall intake manifolds, a 10- by 10-ft longitudinal culvert in each wall, reverse-mounted tainter valves, sidewall ports, and sidewall outlet manifolds. Normal operating heads will range from 15 to 30 ft. The hydraulic system was tested in a 1:25-scale model which simulated all essential features of the prototype. The original design intake and outlet manifolds performed satisfactorily. Tests of the sidewall port arrangements resulted in the adoption of 17 ports per culvert spaced 20 ft on centers with 8- by 8- by 2-ft-deep recesses in the lock chamber floor in front of each port. With the adopted hydraulic system installed in the model, hawser stresses on 4- and 6-barge tows were well within the 5-ton limit during operation at normal. (WES)
W71-07797

SPILLWAY MODIFICATIONS, MIRAFLORES DAM, PANAMA CANAL ZONE: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
T. E. Murphy, and R. S. Cummins, Jr.
Available from the National Technical Information Service as AD-718 801, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-672, Vicksburg, Miss, Jan 1965. 13 p, 16 plates.

Descriptors: *Dams, *Model studies, *Erosion, *Spillways, Stilling basins construction materials, Flow.
Identifiers: Panama, Fluid flow, *Miraflores dam.

Miraflores Dam spillway is a gravity ogee section designed for a maximum head on the crest of 1... The spillway is composed of eight 45-ft-wide ... with vertical-lift gates. The spillway crest is ... elevation 38.67 and the downstream face of the spillway is terminated by a 38-ft radius which brings the toe tangent to a horizontal plane ... elevation -15. No stilling basin is provided. Since the spillway was put in operation in 1917 a maximum flow of 25,290 cfs has been experienced. This flow is about one-fourth of the spillway design flood. Erosion of the rock downstream from the

e spillway has progressed until the dam is in
er of partial failure. Model investigations on a
scale general model and 1:20- and 1:50-scale
on models were made to determine the suita-
of various schemes. (WES)
-07798

**LWAY FOR STOCKTON DAM, SAC
ER, MISSOURI: HYDRAULIC MODEL IN-
TIGATION,**
Engineer Waterways Experiment Station,
sburg, Miss.
Melsheimer.
able from the National Technical Information
ce as AD-718 682, $3.00 in paper copy, $0.95
icrofiche. WES Technical Report 2-683,
sburg, Miss, July 1965. 15 p, 20 plates.

riptors: *Dams, *Model studies, Flow control,
ways, Walls, Missouri, Flow, Stilling basins.
ifiers: Sac River, Stockton Dam.

50-scale comprehensive model and a 1:100-
section model were used to determine flow
tions in the approach channel and the per-
nce of various elements of the Stockton Dam
ure. The overall performance of the original
n structure was satisfactory. Flow conditions
approach, at the abutments, over the spill-
and on the chute were satisfactory. The
ity of the spillway as determined on the
l was greater than the computed. The per-
nce of the original design stilling basin was
actory in the dissipation of all spillway
arges. However, three alternate designs were
igated in an attempt to effect economies in
ruction costs. A stilling basin was developed
permitted a reduction in the size of basin ele-
and permitted the basin elevation to be
5 ft. The model tests also indicated that the
t of the stilling basin divider wall could be
ed 5 ft without affecting the efficiency of the
(WES)
07799

**E ACTION AND BREAKWATER LOCA-
, HALF MOON BAY HARBOR, HALF
N BAY, CALIFORNIA: HYDRAULIC
EL INVESTIGATION,**
Engineer Waterways Experiment Station,
burg, Miss.
Wilson.
able from the National Technical Information
ce as AD-718 224, $3.00 in paper copy, $0.95
icrofiche. WES Technical Report 2-655,
burg, Miss, Oct 1965. 8 p, 24 photos, 23
.

iptors: *Breakwaters, *Gates, Ocean waves,
l studies, Test procedures, California.
fiers: Deep water, Design, Ocean models,
Moon Bay (Calif).

were conducted to investigate (1) flow condi-
and maximum bottom velocities downstream
rapezoidal gate sill without stilling basin; (2)
lative merits of a parabolic gate sill with a
bucket energy dissipator and a parabolic gate
ith a stilling basin consisting of a horizontal
terminated by a sloping end sill; and (3) the
ty of a horizontal protective stone blanket
stream of the most practical energy dissipa-
he trapezoidal gate sill permitted separation
nappe from gate sill and an undesirable flow
tion termed an undulating jet which created
bottom velocities and objectionable surface
in the exit channel. Therefore, the use of
a sill and the possibility of eliminating stilling
at certain low-head dams on the Arkansas
were eliminated from further consideration.
)
07800

**LWAY AND SLUICES, ALLEGHENY DAM,
EGHENY RIVER, PENNSYLVANIA AND
NEW YORK. HYDRAULIC MODEL IN-
VESTIGATION,**
Army Engineer Waterways Experiment Station,
Vicksburg, Miss.
D. R. Bucci, and T. E. Murphy.
Available from the National Technical Information
Service as AD-717 972, $3.00 in paper copy, $0.95
in microfiche. Technical report 2-621, Mar 63. 109
p.

Descriptors: *Dams, *Model studies, *Fluid flow,
*Spillways, *Stilling basins, Sluices, Energy dissipa-
tion, Pennsylvania.
Identifiers: Drainage, Allegheny Dam, Allegheny
River, Stilling basins, Baffle piers.

Investigation of the spillway and sluices on a 1:36-
scale model involved verification of hydraulic per-
formance of the spillway, refinement of the stilling
basin design, and selection of high-level and low-
level sluice designs. Tests indicated that the max-
imum expected discharge (140,000 cfs) was
satisfactorily passed by the spillway and the six low-
level sluices at a head on the spillway crest of 29 ft.
A high-level sluice, discharging through the spill-
way spray walls, with its major axis parallel to the
spillway slope, effectively spread flow across the
spillway weir. A horizontal low-level sluice with
flared exit and tetrahedral deflector provided good
flow distribution in the basin. The stilling basin ef-
fected satisfactory energy dissipation with the
apron raised 3 ft and the baffle pier pier height
decreased 3 ft. (WES)
W71-07801

**FLOW CHARACTERISTICS IN FLOOD-CON-
TROL TUNNEL 10, FORT RANDALL DAM,
MISSOURI RIVER, SOUTH DAKOTA.
HYDRAULIC PROTOTYPE TESTS,**
Army Engineer Waterways Experiment Station,
Vicksburg, Miss.
J. V. Dawsey, Jr., C. J. Huval, and W. C. Blanton.
Available from the National Technical Information
Service as AD-717 974, $3.00 in paper copy, $0.95
in microfiche. WES Technical report 2-626, June
1963. 84 p.

Descriptors: *Dams, *Fluid flow, *Flood control,
*Underground structures, Model studies, Tunnels,
Missouri River, Anemometers, Flow meters, Data
processing.
Identifiers: Transducers, Four Randall Dam, Data
reduction, Flood control tunnels.

Tests were conducted in tunnel 10 to investigate
flow characteristics of a large circular tunnel, flow-
ing full. Measurements included pressures in the
tunnel intake and along the tunnel, and velocity
distributions obtained from nine total-head tubes
mounted on a streamlined strut spanning the tunnel
horizontally. The strut instrumentation also in-
cluded six pressure transducers and three hot-film
anemometers. The electrical signals from the trans-
ducers and anemometers were recorded on both
oscillographs and magnetic tape. Total-head tubes
mounted on boundary zone probes were used to
traverse the region of flow near the wall. Intake and
transition pressures were generally lower than
those measured in a previous model study of the
tunnel. Resistance coefficients indicate an interior
surface intermediate between hydraulically smooth
and rough. (WES)
W71-07802

**DETACHED BREAKWATER AND IMPROVED
NAVIGATION ENTRANCE LORAINE HAR-
BOR, LORAIN, OHIO. HYDRAULIC MODEL
INVESTIGATION,**
Army Engineer Waterways Experiment Station,
Vicksburg, Miss.
H. B. Wilson, R. Y. Hudson, and J. G. Housley.
Available from the National Technical Information
Service as AD-717 975, $3.00 in paper copy, $0.95
in microfiche. Technical report 2-628, June 1963.
92 p.

Descriptors: *Breakwaters, *Navigation, *Harbors,
*Waves (Water), Flowmeters, Storms, Currents
(Water), Velocity, Model studies.
Identifiers: Water traffic, Lorain Harbor, Lorain
(Ohio).

A 1:125-scale model of the harbor and adjacent
areas, equipped with wave-generating and -measur-
ing devices, was used to determine the optimum
length and alignment of a proposed detached
breakwater lakeward of the existing breakwater
system, and the optimum shape and width of
navigation opening to protect the harbor entrance
and mooring area from storm waves and currents,
and to improve navigation conditions for large ves-
sels. Five of the ten plans tested met the wave-
height and current-velocity criteria. The recom-
mended plan of these five, based on economy of
construction, provides for a 2250-ft-long detached
breakwater and the removal of 300 ft of the exist-
ing east breakwater. (WES)
W71-07803

**NAVIGATION AND SEDIMENTATION CONDI-
TIONS AT TYPICAL LOCK AND DAM, AR-
KANSAS RIVER, ARKANSAS AND
OKLAHOMA,**
Army Engineer Waterways Experiment Station,
Vicksburg, Miss.
J. J. Franco, and C. D. McKellar, Jr.
Available from the National Technical Information
Service as AD-717 973, $3.00 in paper copy, $0.95
in microfiche. Technical report 2-623, Apr 1963.
58 p.

Descriptors: *Dams, *Sedimentation, *Navigation,
Inland waterways, Rivers, Oklahoma, Arkansas,
Shoals, Mississippi River.
Identifiers: Site selection, Water traffic, Arkansas
River, Moveable-bed model.

As part of the studies for development of a naviga-
ble waterway from the Mississippi River to the
general area of Tulsa, Oklahoma, a movable-bed,
distorted scale model of a typical 5-mile reach of
the Arkansas River was used to study problems in-
volved in the location, design, and operation of a
lock and dam on an Arkansas River bend. Principal
conclusions were: (1) The lock and dam should be
placed as far downstream of the point of the convex
bar as possible to minimize crosscurrents and
scouring in the upper approach. (2) Ports will be
required in the upper guard wall of the lock to
reduce the intensity of the crosscurrents near the
end of the guard wall. (3) Shoaling in the lower
lock approach, which would tend to be heavy,
could be reduced by a wing wall at the end of the
lower guard wall. (4) There is no appreciable dif-
ference between a stepped-sill and a level-sill dam
insofar as the movement of sediment is concerned.
(WES)
W71-07804

**SPILLWAY AND SLUICES, RED ROCK DAM,
DES MOINES RIVER, IOWA: HYDRAULIC
MODEL INVESTIGATION,**
Army Engineer Waterways Experiment Station,
Vicksburg, Miss.
D. R. Bucci, and T. E. Murphy.
Available from the National Technical Information
Service as AD-718 680, $3.00 in paper copy, $0.95
in microfiche. WES Technical report 2-673, Mar
1965. 98 p.

Descriptors: *Dams, *Model studies, *Spillways,
*Sluice gates, Iowa, Cavitation, Test procedures,
River flow, Pressure.
Identifiers: Des Moines River, Red Rock Dam.

The spillway and sluices of Red Rock Dam were
studied on a general model of the spillway and on a
section model of the sluice outlet. Particular
emphasis was given determination of the maximum
elevation of the stilling basin apron and minimum
height of the training walls. Studies were also con-
ducted to determine pressure conditions at the slu-
ice outlet portals and the effect of spillway flow on

the capacity of the sluices. The combined capacity of the spillway and sluices was less than computed because of losses at the spillway abutments and the effect of the spillway nappe on the sluice flow. The recommended stilling basin utilized a 206.48-ft-long apron at elevation 654 surmounted by two rows of 12-ft-high baffle piers and a 10-ft-high end sill. The training walls performed satisfactorily with their tops at elevation 715. This basin barely maintained the hydraulic jump at the spillway design flood. The sluice outlet model tests indicated that cavitation will not occur at the sluice outlet portal under the proposed method of combined spillway-sluice operation. As a check on this conclusion, the Folsome Dam high-level sluice was reproduced in this model. (WES)
W71-07805

STABILITY OF SOUTH JETTY SIUSLAW RIVER, OREGON, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Jackson.
Available from the National Technical Information Service as AD-717 976, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-631, July 1963. 58 p.

Descriptors: *Jetties, *Rock fills, *Sea walls, *Model studies, *Harbors, Rock properties, River training, Water waves, Stability, Rehabilitation.
Identifiers: Siuslaw River.

Tests were conducted on 1:50-scale models of jetty sections to obtain design criteria for rehabilitation of the south jetty at the mouth of the Siuslaw River, and for similar jetties at the entrances to rivers along the Washington and Oregon coasts. The tests were also concerned with evaluating a special method of stone placement, developed by the Portland District. It was concluded from the investigation that: (1) one layer of quarrystones placed on the crown and on side slopes of 1:1.5 would be suitable for the repair of jetties situated in water depths less than about 16 ft, and design-wave heights not greater than 13 ft; (2) two layers of quarrystones on side slopes of 1:2 from crown to low-tide elevation would be suitable for the repair of jetties situated in water depths greater than 16 ft, and for design-wave heights as large as 17 ft; (3) at the jetty head, two layers of quarrystones at the junction of the head and trunk to four layers along the line of the jetty shoulder are needed for adequate protection; and (4) the special Portland District method of placement slightly improves the stability of the quarrystone cover layers compared with other random placement methods. (WES)
W71-07806

AN EVALUATION OF OKRA GUM AS A DRAG REDUCING ADDITIVE IN PIPE FLOW,
Clemson Univ, S.C. Dept. of Engineering Mechanics.
Joseph George Neuwirth, Jr.
M.S. Thesis, Clemson University, Aug 1970. 71 p, 19 fig, 19 ref, append. OWRR Project A-009-SC (2).

Descriptors: *Friction, *Fluid friction, Flow, *Pipes, Hydraulics, Viscosity, *Lubricants.
Identifiers: Friction reduction, *Okra gum, Guor gum, Polyethylene oxide.

The specific purpose was to study the relation of additives to the phenomenon of drag reduction by constructing and instrumenting suitable flow systems that would perform within both the laminae and turbulent flow regimes. Okra gum in aqueous solution is a very effective drag reducing additive. Friction reduction was not related to any property changes since viscometric measurements showed apparently Newtonian behavior for concentrations as high as 250 weight parts per million (WPPM). Solutions with okra gum displayed superior friction reducing characteristics for low Reynolds number flows with an optimum effect resulting from a concentration of 25 WPPM as compared to 50 WPPM with polyethylene oxide. Although there was no indicated drag reduction onset point for the okra gum, its behavior indicated that its viscoelastic properties and molecular structure were comparable to that of guar gum and polyethylene oxide.
W71-07837

URBAN RUNOFF BY ROAD RESEARCH LABORATORY METHOD (DISCUSSION),
For primary bibliographic entry see Field 04C.
W71-07841

URBAN RUNOFF BY ROAD RESEARCH LABORATORY METHOD (DISCUSSION),
For primary bibliographic entry see Field 04C.
W71-07844

REAL-TIME COMPUTER CONTROL OF URBAN RUNOFF, (DISCUSSION),
George Fleming, and Robert L. McFall.
J Hydraulics Div, Am Soc Civil Engrs, Vol 96, No HY9, p 1908-1909, Sept 1970.

Descriptors: *Runoff, *Hydraulics, *Mathematical models, *Digital computers, Water management (Applied).

Fleming: A method to calculate continuous runoff volumes preferred by the writer is to employ simulation techniques using the Hydrocomp Simulation Program which simulates the complete land phase of the hydrological cycle, and uses kinematic wave assumptions for flow in circular conduits. For purposes of the mathematical model a large scale computer could be assessed using the PDP-9 for data acquisition and control of automatic gates. McFall: The writer would like to see a breakdown of costs into the categories of (1) capital outlay, (2) equipment operating, and (3) personnel cost. (See also W70-05882)
W71-07845

STORM SEWER DESIGN,
For primary bibliographic entry see Field 05G.
W71-07864

ANALYSIS OF SLOT ORIFICE FISHWAYS,
Idaho Univ., Moscow.
For primary bibliographic entry see Field 08I.
W71-08045

RELATIONSHIP BETWEEN THE RATE OF SHORE DEFORMATION AND FLOW VELOCITY (RUSSIAN: ZAVISIMOST' INTENSIVNOSTI BEREGOVYKH DEFORMATSIY OT SKOROSTI POTOKA),
Moscow State Univ., (USSR).
N. A. Milhaylova, and O. B. Shevchenko.
Meteorologiya i Gidrologiya, No 12, p 80-83, Dec 1970. 4 p, 2 fig, 5 ref.

Descriptors: *Deformation, *Shore protection, *Beach erosion, *Flow rates, *Sediment transport, Channels, Flumes, Channel morphology, Channel erosion, Dikes, Bottom sediments.
Identifiers: *USSR, Flow velocity, Channel deformations, Bottom erosion.

A deformation rate defined as the ratio of the change in the value of a certain channel characteristic to time is used to describe the interaction of flow and a deformable bottom, and the interaction of flow and erosible shores. Data on the rate of shore deformations and flow velocity for an entire channel width suggest that flow velocity is one of the principal factors determining the rate of shore deformations. Characteristics of depth deformations and the discharge and transport rate of a stream are determined by average depth of velocity, velocity at a distance of several particle diameters, and velocity at a distance of one-eighth of the width of the channel from the shore. T graph derived shows a sharp decrease in the rate deformations as a result of shore protection tetrahedrons and pile dikes. Laboratory stud were conducted in a channel flume 23 m long, 4 wide and 1 m high, using Lyubertsy sand 0.25 n in size. (Josefson-USGS)
W71-08102

TRANSFORMATIONS OF BREAKING WA CHARACTERISTICS OVER A SUBMARI BAR,
Michigan State Univ., East Lansing. Dept. Geology.
William L. Wood, Jr.
Available from the National Technical Informat Service as AD-718 904, $3.00 in paper copy, $0 in microfiche. Dept. of Geology Technical Rep No 4, Dec 1970. 116 p. ONR 388-089.

Descriptors: *Beaches, *Ocean waves, *La *Beach erosion, Lake Michigan, Lake beds.
Identifiers: *Lake waves, Wave functions, Oc bottom, Great Lakes, Submarine bars.

The effect of a submarine bar on the transfor tion of breaking wave characteristics is to crea filter on wave celerity and length. The degree of tering is directly related to the intensity of w breaking. The filtering effect of the submarine suggests that this is the reason for better agreem between observed wave parameters and theor the reforming zone shoreward of the subma bar. The role of turbulence of flow induced breaking is the most important factor in w height attenuation shoreward of the submarine As a result theoretical expressions for sha water wave transformations in the nearshore z must take turbulent dissipation into considera as a major factor.
W71-08169

DESIGN CONDUIT SYSTEM BY DYNA PROGRAMMING,
Hawaii Univ., Honolulu. Dept. of Agricultural gineering.
Tung Liang.
Journal of the Hydraulics Division, ASCE, Vo No HY 3, p 383-393, Mar 1971. 11 p, 4 fig, 17 2 append.

Descriptors: *Dynamic programming, *Optim tion, *Systems analysis, *Distribution syst *Design, *Digital computers, Conduits, Pipeli Costs, Constraints, Pressure, Water transfer.

A method based on dynamic programming systems analysis wasdeveloped for optimizi fluid distribution system. For the purpose of te the dynamic programming technique in analy the tremendous number of system alternatives in optimizing system design, a simple water t port system (serial type) was first considered sisting of N pipe segments with known cha teristics jointed in a straight line. The desig responsibility was to evaluate all possible alte tives and select the most economical design. method included measurement of the system e tiveness, consideration of transformations and straints, and the use of dynamic programmi order to decompose the problem so decisions proceed one or two at a time with the use digital computer. Stagewise optimization achieved and the problem was converted fr multiple decision single-stage problem into a m ple stage single-decision problem. The optimiz logic was outlined in a flow chart and an exa where the design engineer must minimize a cost for a 200-ft. pipeline was described and so It was observed that input pressure and pipe figuration have a considerable influence on the of transporting fluid. (Kriss-Cornell)
W71-08191

INTRODUCTION TO BAYESIAN METH USING THE THOMAS-FIERING MODEL,
Kansas City Univ., Manhattan.

primary bibliographic entry see Field 06A.
-08194

USE OF RIVER MODELS IN POWER
NT HEAT EFFECT STUDIES,
cester Polytechnic Inst., Mass. Alden Research
.
primary bibliographic entry see Field 05B.
-08315

ATIFICATION OF FLOW FROM CHAN-
INTO DEEP LAKE, (DISCUSSION),
South Wales Univ., Kensington (Australia).
er Research Lab.
Wilkinson.
nal of the Hydraulics Division, Transaction of
rican Society of Civil Engineers, Vol 97, No
, p 602-609, Apr 1971.

riptors: *Heated water, *Thermal stratifica-
*Cooling, *Hydraulic jump, *Heat transfer,
rgy equation, Continuity equation, Lakes,
mal pollution.
ifiers: *Entraining jumps, *Skimmer gate.

writer of the discussion describes his own in-
gation into one aspect of flows which may
t when heated water is discharged from a
nel into a reservoir containing cooler water,
ly, where the discharge from the channel out-
s internally supercirtical. An analysis of an en-
ing jump controlled by a skimmer gate is
nted. The author's classification of two layer
ified flows is extended by the writer, who con-
s the effect of entrainment in the transition
on the characteristics of the layer
nstream. Three equations are used for this pur-
(1) continuity of density difference in the
on comprising entraining and roller zones; (2)
ibrium of the horizontal momentum flux and
ure force per unit width upstream and
nstream of the jumps; and (3) energy conserva-
downstream. The writer concludes that when
idering maximum efficiency of cooling ponds
eat dissipators, the problem of designing the
ng water outfall becomes that of maintaining a
ied internal jump at the outfall. (Oleszkiewicz-
derbilt)
-08321

Hydraulic Machinery

CTICAL PROBLEMS IN COMBINING
CTRIC POWER PRODUCTION WITH SEA
ER DESALINATION,
Diego Gas and Electric Co., Calif.
. Hardway.
ale by the Superintendent of Documents, US
rnment Printing Office, Washington, DC,
2, Price $0.45. Office of Saline Water
arch and Development Progress Report No
Dec 1970. 34 p, 8 fig. OSW Contract 14-01-
-1142.

riptors: *Desalination, *Saline water conver-
*Flash distillation, *Electric power, *Power
s, Power systems operations, Maintenance
peration, Desalination equipment.
ifiers: Desalination plant operations, Power
operations.

document contains a general discussion con-
ng the management, operation, and informa-
gained in combining a commercial electric
y power plant with desalination plants. The
r plant is providing electric power and steam
directly from the boilers and through turbine
ction) to the desalting plants. The desalting
s consist of a 1,000,000 gallon per day multi
, multi stage, high performance plant and a
,000 gallon per day plant. The power plant is
mega watt steam cycle, fuel fired, compound
le flow turbine unit of the San Diego Gas and
ric Company. (Lohman-Office of Saline
r)
-07833

SHORT TERM PROSPECTS FOR IMPROVING EFFICIENCY OF POWER PLANTS,
Massachusetts Inst. of Tech., Cambridge.
Herbert H. Woodson.
In: Electric Power and Thermal Discharges; Thermal Considerations in the Production of Electric Power. Gordon and Breach, New York, p 269-279, 1971.

Descriptors: *Thermal pollution, *Thermal powerplants, *Nuclear powerplants, *Efficiencies, *Cooling, *Cooling water.
Identifiers: *Fossil-fueled powerplants, *Combustion gas turbines, Reactors, Gas-cooled reactors, Breeder reactors.

For fossil-fueled plants, it appears that short term improvements in efficiency will most likely come from combined cycles using combustion gas turbines as topping units with steam cycles. Another technically possible concept for improved efficiency is the binary vapor cycle but much development work would have to be done on it. Light-water, nuclear-fueled plants will have small evolutionary increases in efficiency over the short term. Significantly higher efficiency in nuclear plants could result from widespread use of the high-temperature, gas-cooled reactor. Advanced breeder reactors with significantly higher efficiencies have a chance of making a commercial appearance over the short term. (See also W71-08298) (Oleszkiewicz-Vanderbilt)
W71-08311

8D. Soil Mechanics

SEISMIC ACTIVITY IN THE VICINITY OF SAN LUIS RESERVOIR,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
George C. Rouse.
Available from the National Technical Information Service as PB-197 327, $3.00 in paper copy, $0.95 in microfiche. Report REC-OCE-70-52, Nov 1970. 7 p, 5 fig, 2 tab, 4 ref.
Identifiers: Earth dams, Seismic studies, Earthquake engineering, Seismology, Seismic investigatations, Earthquakes, California, Central Valley Project, Faults geology, Seismic waves, Reservoir design, Reservoir sites, Seismographs, San Luis Reservoir (Calif), San Luis Dam (Calif), San Andreas Fault (Calif), Ortigalita Fault (Calif).

For many years, engineers have been concerned that loads produced by large reservoirs on the earth's crust could cause earthquakes. This problem was first investigated during the initial filling of Lake Mead by making seismic recordings at 3 locations near this lake. Data obtained from these recordings indicated that crustal loadings produced by the reservoir did not cause an increase in local earthquakes. A similar study was made during the filling of San Luis Reservoir, a 2,100,000-acre-ft body of water located near Los Banos, Calif. The reservoir is in an area which has been subjected to intense activity. A portion of the Ortigalita Fault extends beneath the lake area, and the San Andreas Fault passes within 22 mi of this location. Data obtained during the San Luis seismic investigation also furnish little or no indication that reservoir loadings on the earth's crust cause an increase in local earthquakes.
W71-08170

ERODIBILITY OF SLOPES (PHASE I),
California State Div. of Highways. Materials and Research Dept.
For primary bibliographic entry see Field 02J.
W71-08171

8F. Concrete

INVESTIGATION OF NONMETALLIC WATERSTOPS, REPORT 5. RETENTIVITY OF LABYRINTH-SHAPED WATERSTOPS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Billy J. Houston.
Available from the National Technical Information Service as AD-718 226, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 6-546, Vicksburg, Miss, Jan 1971. 10 p, 2 tab, 6 photos.

Descriptors: *Sealants, *Environmental effects, *Leakage, Water pressure, Hydraulic systems, Concrete, Rubber, Plastics, Failure (Mechanics), Joints (Connections), Degradation, Weathering.
Identifiers: Polyvinyl chloride, Shear stresses, Separation, Synthetic rubber, Labrinth shaped waterstops, Water retention.

This is the fifth report in the Investigation of Nonmetallic Waterstops series, and presents the results of tests conducted to evaluate the water-retaining properties of labyrinth-shaped waterstops of two shapes. The advantage of labyrinth waterstops over waterstops of conventional shape is that the use of labyrinth waterstops does not require splitting and bracing of concrete forms so that the waterstop can protrude from one placement into the area where the next placement will come. Since the Corps of Engineers is now allowing the use of labyrinth waterstops under certain conditions where little or no differential joint movement is expected, there was a need to know how well labyrinth waterstops inhibit the passage of water through a joint. Report 4 of the series included the results of water-retentivity tests of conventional waterstops of four shapes, and the results of the tests of the labyrinth waterstops reported herein are compared with those results obtained earlier. The results of the tests and comparisons indicate that labyrinth waterstops are as effective in retaining water as conventionally shaped waterstops when there is no joint separation. Tests reported herein indicated that a joint separation of 1/4 in. seriously reduces the water-retaining properties of labyrinth waterstops, but an opening of 1/8 in. can be tolerated when hydraulic pressure behind the waterstop is below 100 psi. Apparently, failure of the seal when a joint is open even a small amount and hydraulic pressure is applied is caused by the pressure acting perpendicular to the concrete ridges within the waterstop, causing the concrete to fail in flexure. (WES)
W71-07795

GUNITE GIVES NEW LIFE . . . TO AN OLD, FALLING BRICK SEWER SYSTEM,
William M. Englerth.
Am City, Vol 85, No 7, p 101-102, Jul 1970.

Descriptors: *Sewers, *Construction, *Gunite, Repairing, Costs, Tennessee, Concretes, Linings.
Identifiers: *Chattanooga (Tenn), Sewer lining, Capacity.

A visual inspection of the brick sewer system in Chattanooga, Tennessee resulted in its rehabilitation with pneumatically applied reinforced concrete lining, known as gunite. This repair method reduces the carrying capacity; however, the newly lined surface reduces many existing friction losses in the deteriorating conduit, and capacity in the repaired sewer is increased from the higher flow velocities. A total of $633,113.70 was needed to repair the main brick sewers in the downtown area of Chattanooga.
W71-07858

8G. Materials

INVESTIGATION OF NONMETALLIC WATERSTOPS, REPORT 5. RETENTIVITY OF LABYRINTH-SHAPED WATERSTOPS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08F.
W71-07795

SEAWATER CORROSION TEST PROGRAM SECOND REPORT,
Dow Chemical Co., Freeport, Tex.
H. C. Behrens, C. F. Schrieber, O. Osborn, L. Rice, and B. P. Webb.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $1.25. Office of Saline Water Research and Development Progress Report No 623, Dec 1970. 113 p, 48 fig, 9 tab, 11 ref, 2 append. OSW Contract 14-01-0001-2150.

Descriptors: *Corrosion, *Desalination, Deaeration, *Steel, *Aluminum, Aluminum alloys, Stainless steel, *Alloys, *Temperature, Dissolved oxygen, Carbon dioxide, Sea water, Saline water, Metals.
Identifiers: Mild steel, Low alloy steel, Corrosion rates.

Hot seawater performance was considered for a mild steel, a high-strength, low alloy steel, three experimental low alloy steels, four stainless steel wrought and cast alloys, seven aluminum alloys, and one Alclad composition. Variables of dissolved oxygen, temperature, velocity, pH, and refreshment rate of seawater were considered. Low alloy steel corrosion rates were 30 percent less than mild steel for the same oxygen concentration. This advantage was pronounced through 300-ppb oxygen concentration levels. Mild steel was sensitive to temperatures above 225F; less sensitive below. Optimum conditions for aluminum alloys in hot seawater is acidic pH at 50 to 100 ppb oxygen. Aluminum is possibly independent of oxygen after preconditioning. Alloys 3003 and 5454 showed highest level of performance. Alclad alloy 7072 self corrosion rate too high for satisfactory service life. (Filban-Office of Saline Water)
W71-07975

INVESTIGATION OF GALVANICALLY INDUCED HYDRIDING OF TITANIUM IN SALINE SOLUTIONS,
Battelle Memorial Inst., Richland, Washington. Pacific Northwest Labs.
L. A. Charlot.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $0.50. Office of Saline Water Research and Development Progress Report No 624, Dec 1970. 40 p, 11 fig, 8 tab, 18 ref, append.

Descriptors: *Corrosion, *Desalination, *Titanium, *Temperature, *Hydrogenation, Metals, Alloys, Inorganic compounds, *Steel, Stainless steel.
Identifiers: Titanium-Hydride, Galvanic-Couples, Nickel alloy.

Galvanically induced hydriding of commercially pure titanium and titanium-2 nickel alloy was determined in 3.4 wt percent NaCl air-sparged and argon-sparged solutions at 140, 265, and 390F. Hydrogen charging of the titanium via couple assemblies of titanium to aluminum, titanium to mild steel, titanium to copper, titanium to nickel, and titanium to stainless steel was measured by high temperature vacuum extraction analysis of the exposed titanium metal. The presence of hydrogen in the titanium was verified by metallographic analysis, which also showed the distribution of hydrogen in the metal. Assessment of corrosion, apart from hydriding, of both members of the galvanic couple was made by weight change determinations and visual inspection. Galvanic couples were withdrawn from the test after 14, 42, 72, and 146 days at temperature and destructively analyzed to yield the required data. A corrosion performance ranking from least to most corrosion resistant for the metals coupled with titanium in the 140F argon-sparged test (least aggressive) is Al AA Mild Steel A Cu — Ni — Stainless Steel. In the 390F air-sparged test (the most aggressive), the extent of corrosion of the dissimilar metals necessitated removal of aluminum and mild steel from the test after 14 days at temperature and removal of all samples after 72 days exposure. A relative ranking for this test is Al AA Mild Steel AA Cu — Stainless Steel A Ni. (Filban-Office of Saline Water)
W71-07976

DEVELOPMENT OF A CALIBRATION MODULE FOR TRACE OXYGEN ANALYZERS,
Aerojet-General Corp., El Monte, Calif.
H. C. Edgington, and R. M. Roberts.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $1.25. Office of Saline Water, Research and Development Progress Report No 625, Dec 1970. 140 p, 17 fig, 27 tab, 7 ref, 2 append. OSW Contract 14-01-0001-2127.

Descriptors: *Desalination, *Dissolved oxygen analyzers, *Volumetric analysis, Oxygen, Oxygenation, Dissolved oxygen, Analytical techniques.
Identifiers: Winkler Method.

The design, fabrication, and testing of a Dissolved Oxygen Calibrator is described. The calibration module achieves deoxygenation in a two-stage spinning-disc stripper by flowing feedwater and oxygen-free nitrogen gas countercurrently. Oxygen is added by coulometric generation into the second-stage nitrogen purge gas. This instrument gives D. O. contents of 0 to 100 ppb which are accurate to within plus or minus 2 ppb. Inasmuch as existing methods for D. O. analysis were of undetermined accuracy, a parallel research was conducted which resulted in the development of an Aerojet-modified Winkler procedure. The novel features of this improved method include (1) sampling, fixing, and titrating under a nitrogen atmosphere, (2) treating the sample by a novel combination of single and double, normal and reverse mode of reagent additions to obtain data for the absolute determination of sample D. O. content, and (3) measuring and correcting for certain errors in the D. O. procedure. This has resulted in a procedure with demonstrable accuracy. The improved method has a precision and accuracy which is better than plus or minus 2 ppb. (Filban-Office of Saline Water)
W71-07977

8H. Rapid Excavation

HEAT-ASSISTED TUNNEL BORING MACHINES,
United Aircraft Corp., East Hartford, Conn. Research Labs.
Jeffrey P. Carstens, W. Richard Davison, Choate A. Brown, Frederick J. McGarry, and Alan R. Smith.
Available from the National Technical Information Service as PB-197 243, $3.00 in paper copy, $0.95 in microfiche. United Aircraft Research Laboratory Report No J-970802-12 and Federal Railroad Administration Report RT-71-63, Sept 1970. 328 p. FR9-0035.

Descriptors: *Rock excavation, *Drilling equipment, *Tunneling machines, Thermal properties.
Identifiers: *Rock drilling, *Gas lasers, Heating equipment, Radiant heating, Cutting tools, *Heat weakening, *Heat assisted tunneling.

A study was performed to determine: (1) the increase in tunneling machine performance in hard rock resulting from heat weakening of the rock in advance of the tunneling machine, (2) the increase in hourly cost incurred by the heating system, and (3) the net effect of the increased performance and the increased hourly cost on the cost of the finished tunnel. Rock-cutting experiments were perfor on Barre granite using a 1-kw CO2-N2-He gas l for rock heating and disc-type cutters of var diameters. Analytical work included the prep tion of specific heat-assisted tunneler designs their expected performance and economics. A ternative form of using heat for tunneling was investigated in which slots were melted in the instead of merely heating it. The study concl that the operation of tunneling machines in porating lasers to provide the heat weakeni technically feasible but economically unattrac Radiant heaters have insufficient power densi effectively heat the rock, and high-temperature create serious environmental problems. How the test program indicated that a more effe way to assist mechanical cutters would be to concentrated thermal energy to melt shallow in the rock between cutter paths.
W71-08168

8I. Fisheries Engineering

CENTRARCHID FOOD HABITS IN A NEW OLD RESERVOIR DURING AND FOLLOW BASS SPAWNING,
Bureau of Sport Fisheries and Wildlife, F teville, Ark.
For primary bibliographic entry see Field 02H.
W71-08035

ANALYSIS OF SLOT ORIFICE FISHWAYS,
Idaho Univ., Moscow.
Purushottam Dass.
M. S. Thesis, Idaho University Graduate Sc Dec 1970. 101 p, 28 fig, 27 tab, append.

Descriptors: *Hydraulic design, *Fish pas *Hydraulic models, Hydraulics, Design, Hyd engineering, Open channel flow, Silting, Discharge (Water), Velocity, Streamflow, Hy lic structures, Weirs, Spillways.
Identifiers: Rectangular-slot fishways.

Design criteria were developed for a slot fishway. Sizing and spacing of slot orifices the fishway can be design to create flow cond satisfactory for fish passage. The slot orifice way will function well in a wide range of disch and should not have any serious silting prob Values of drag coefficients for the slot orifice strictions were evaluated by model studies range of slot openings varying from 0.6 to 0 fishway width and culvert slope varying horizontal to five percent. Nondimensional are given for the values of the drag coefficie the slot orifice constrictions and also fo backwater relations for the slot orifices. An tion, based on momentum principle, enabl designer to find the rate of flow through th way. Necessary criteria regarding suitability for fish passage are also developed. (Knapp-U
W71-08045

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH INVE RY - 1969.
Department of National Development, Ca (Australia).

Australian Water Resources Council, Research and Education Steering Committ port, 1969. 212 p, 2 index.

Descriptors: *Projects, *Hydrology, resources, *Foreign research, *Research fa Laboratories, Water resources develo Groundwater, Surface waters, Meteorolog water, Sedimentation, Hydraulics, Urbanizat
Identifiers: *Australia, *Water resources res

inventory of research into water resources and ectly related matters in Australia, with brief erence to earlier work is compiled from stionnaires circulated in mid-1968, and in- des projects undertaken since 1964 or planned commence during 1968/69. Each research pro- is numbered and arranged serially, with pro- s from each institution grouped together as in- ated in the Index of Research Institutions. Sub- index terms are allotted to each project. The ti- of projects are inserted in the subject index inst the index term so that a user may review all ject titles associated with any given index term. dresses of research institutions are given in the ex of Research Institutions. The Subject Index ms are from the vocabulary of the Water ources Thesaurus published by the Office of ter Resources Research, U.S. Department of Interior, Washington, D.C., November 1966. app-USGS)
1-08093

10. SCIENTIFIC AND TECHNICAL INFORMATION

A SELECTED ANNOTATED BIBLIOGRAPHY OF ENVIRONMENTAL STUDIES OF IRAQ, JORDAN, LEBANON, AND SYRIA (1960 - 1969),
Environmental Technical Applications Center (Air Force), Washington, D.C.
For primary bibliographic entry see Field 02B.
W71-07838

PHOSPHORUS IN WATER AND WASTE WATER-AN ANNOTATED SELECTED BIBLIOGRAPHY,
North Carolina Univ., Chapel Hill. Waste water Research Center.
For primary bibliographic entry see Field 05B.
W71-07894

EARTH RESOURCES RESEARCH DATA FACILITY INDEX: VOLUME I, DOCUMENTARY DATA; VOLUME II, SENSOR DATA.
National Aeronautics and Space Administration, Houston, Tex. Manned Spacecraft Center.
For primary bibliographic entry see Field 07C.
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CONSERVATION DIRECTORY 1971.
National Wildlife Foundation.
For primary bibliographic entry see Field 06E.
W71-08236

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California Univ., Los Angeles.
For primary bibliographic entry see Field 06B.
W71-08296

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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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REACTIONS OF A STRONGLY BASIC ION EXCHANGE RESIN WITH DILUTE AQUEOUS SOLUTIONS IN A COLUMNAR SYSTEM,
Michigan Univ., Ann Arbor. Div. of Sanitary and Water Resources Engineering.
For primary bibliographic entry see Field 05D.
W71-08391

02. WATER CYCLE

2A. General

THE NATIONAL HYDROLOGIC BENCHMARK NETWORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07A.
W71-08327

INTERNATIONAL HYDROLOGICAL DECADE YEARBOOK OF THE FEDERAL REPUBLIC OF GERMANY-CALENDAR YEAR 1967.
For primary bibliographic entry see Field 07C.
W71-08346

DRAINAGE PATTERN ANALYSIS, SOUTHERN HIGH PLAINS, WEST TEXAS AND EASTERN NEW MEXICO,
Texas Technological Coll. Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 02F.
W71-08354

PROBLEMS OF HYDROLOGIC FORECASTS AND COMPUTATIONS (RUSSIAN: VOPROSY GIDROLOGICHESKIKH PROGNOZOV I RASCHETOV),
For primary bibliographic entry see Field 04A.
W71-08374

WATER RESOURCES AND WATER BALANCE OF THE UKRAINE AND MOLDAVIA (RUSSIAN: VODNYYE RESURSY I BALANS VOD UKRAINY I MOLDAVII),
For primary bibliographic entry see Field 04A.
W71-08388

NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,
Texas Univ., Austin. Dept. of Civil Engineering.
W. J. Claborn, and Walter L. Moore.
Available from the National Technical Information Service as PB-199 644, $3.00 in paper copy, $0.95 microfiche. Hydraulic Engineering Laboratory Technical Report HYD 14-7001, Aug 1970, 225 p, 9 fig, 4 ref, 2 append. OWRR Project B-015-TEX (3).

Descriptors: *Water-beds (Basins), *Model studies, *Demonstration watersheds, Computer models, Mathematical models, *Synthetic hydrology, *Simulation analysis, Dynamic programming, Numerical analysis.
Identifiers: Stanford waterbed model, *Watershed models.

This research developed methods for a numerical simulation of watersheds which will be both operational from the standpoint of engineering usage and realistic from the standpoint of simulating physical processes occurring in the watershed. The Stanford Watershed Model has been reviewed and used as a pattern for developing a new watershed simulation model. The new model incorporates considerable flexibility of input data and model time steps which were not available in the Standford Model. In making a detailed translation of the model into Fortran IV compiler language, a nearly complete understanding of the model was achieved and has been presented as a part of the report. New parameters describing the infiltration, evaporation, and soil water movement processes have been defined and related to physical properties of the watershed where possible. Application to two experimental watersheds are reported.
W71-08392

HYDROLOGICAL RESEARCH IN SOUTH AFRICA,
University of the Witwaterstrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 06B.
W71-08466

AN EXPERIMENT IN DETERMINISTIC WATERSHED MODELING,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
Darrel E. Dunn.
Water Resources Bulletin, Vol 7, No 2, p 343-347, Apr 1971. 5 p, 1 fig, 6 ref. OWRR Project A-025-MONT (2).

Descriptors: *Mathematical models, *Rainfall-runoff relationships, *Simulation analysis, Routing, Numerical analysis, Computer programs.
Identifiers: Deterministic models, Finite difference method.

An experimental three-dimensional watershed model in the form of a Fortran IV program was constructed. The model was an oversimplified one which divided the watershed volume into layers of cells which represented the overland flow, the vadose, and the phreatic zones. Water budget equations which utilized such formulas as Darcy's law and Manning's equation were applied to each interior cell. The resulting set of simultaneous equations was solved for heads at the end of successive time increments. This information was transformed to streamflow and other hydrologic output. Input was weather data, which effected appropriate adjustments in the cells representing the surface-water and vadose zones. After testing the model, it was concluded that this type of model is indesirably sensitive to cell size and length of time increment. In spite of the deficiencies of this primitive model, this general kind of approach to modeling seems promising, but it may be necessary to devise new transport equations which apply to more natural divisions of watersheds. (Knapp-USGS)
W71-08531

OBSERVATIONS OF THE EFFECT OF EXTREME HIGH WATER IN 1965 AND 1966 ON THE GROUNDWATER BODY OF THE LIENZ BASIN-EAST TIROL (GERMAN: BEOBACHTUNGEN UBER DIE AUSWIRKUNG DER EXTREMEN HOCHWASSER 1965 UND 1966 AUF DEN GRUNDWASSERKORPER IM BECKEN VON LIENZ (OSTTIROL),
G. Platzer.
English abstract. Steirische Beitrage zur Hydrogeologie, No 20, Graz, p 81-98, 1968. 18 p, 6 fig, 2 tab, 7 ref.

Descriptors: *Surface-groundwater relationships, *Floods, *Groundwater recharge, *Water levels, Rainfall-runoff relationships, Water level fluctuations, Groundwater basins, Water storage, Water temperature, Water chemistry.
Identifiers: *Lienz (Austria), *Austria.

The groundwater body of Lienz and the surrounding districts extends on both sides of the river Drau from the mouth of the Pustertal at Leisach to the border between the provinces of Carinthia and Tirol, Austria. The basin is bordered by steep mountains, over 2000 m high, consisting of crystalline schists and mexozoic rocks, and it is connected with other groundwater bodies only at three narrow points of the Drau and Isel valleys. The reservoir covers an area of 35 sq km, is approximately 16 km long and up to 4 km wide, and is situated in quarternary deposits of unknown thickness. The reservoir has one underground outlet in the western part, and an underground and surface outlet of approximately the same size in the eastern part. The groundwater discharge is min. 3 cu m/sec. Average rainfall is 900 to 2000 mm per annum. The three floods of September 1965, August and November 1966 with a measured rainfall of 144--259 mm had a great effect on the groundwater body. The groundwater tables rose up to 4.80 m. The flow direction changed up to 90%. A raise of groundwater temperature of 0.9 to 2 deg. C. was also recorded in some wells after the floods. Even more significant was the change of the chemical characteristics of the groundwater. The pH-value, the electrolytic conductivity, the total hardness, the carbonate and noncarbonate hardness increased considerably. (Knapp-USGS)
W71-08580

EFFECTS OF AREAL AND TIME DISTRIBUTION OF RAINFALL ON SMALL WATERSHED RUNOFF HYDROGRAPHS,
Minnesota Univ., Minneapolis. Dept. of Agricultural Engineering.
T. C. Wei, and C. L. Larson.
Available from the National Technical Information Service as PB-199 837, $3.00 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center, Bulletin 30, 1971. 118 p, 31 fig, 28 tab, 71 ref. OWRR Project A-017-MINN (2).

Descriptors: *Rainfall-runoff relationships, *Mathematical model, *Peak discharges, Watershed, Minnesota, Climate, Precipitation, Hydrographs, Storm runoff, Routing, Computer, Overland flow, Channels, Geology, Soil types, Topography.
Identifiers: *Watershed model, *Rainfall excess, *Storm movement, Lag time, Time distribution, Areal distribution.

A mathematical watershed model of 1.456 square miles was developed to route runoff through overland flow and through the channel system. Excess rainfall was used as input data and the flow was routed by the successive numerical solution of the kinematic wave equations to produce outflow hydrographs for elementary (first order) watersheds. These hydrographs were used as input to the channel system where the flow was routed by the successive numerical solution of the dynamic wave equations to yield the outflow hydrograph for the model watershed. Backwater effects were considered at most of the junctions of the model watershed. The model was used to study the effects of time distribution and areal distribution of rainfall, storm movement and watershed shape on the runoff hydrograph. In each study, attempts were made to find a relationship between an appropriate input parameter and a modification (peak flow) coefficient, to be used in adjusting the peak discharge estimated by conventional methods, which normally assume a stationary, constant intensity storm uniformly distributed over the watershed. The results of this study indicate that, in general, the selected factors have significant effects on peak discharge. (Walton-Minnesota)
W71-08664

2B. Precipitation

A NEW SYSTEM FOR THE AUTOMATIC MEASUREMENT AND RECORDING OF RAINFALL,
Royal Aircraft Establishment, Farnborough (England).
For primary bibliographic entry see Field 07B.
W71-08339

CALCULATED AND OBSERVED CHANGES IN SEA SURFACE TEMPERATURE ASSOCIATED WITH HURRICAN PASSAGE,
Naval Postgraduate School, Monterey, Calif. Dept. of Oceanography.

Jack James Jenson.
Available from the National Technical Information Service as AD-713 052, $3.00 in paper copy, $0.95 in microfiche. MS Thesis, Naval Postgraduate School, Sept 1970. 55 p, 16 fig, 1 tab, 16 ref.

Descriptors: *Water temperature, *Gulf of Mexico, *Hurricanes, Surface waters, Meterological data, Model studies, Computer models, Hydrologic data, Forecasting, Heat transfer, Advection, Convection, Thermal stratification, Oceanography, Data collections.
Identifiers: Ocean-temperature changes (Hurricanes).

Analyses were made of the sea surface temperatures in the Gulf of Mexico for the month of August for the four years 1965 through 1968. No one pattern was found to predominate. The subsurface profiles were then considered, and a rate of simulated withdrawal of 4000 calories of heat per day was made, until the temperature did not exceed 26 deg C. This withdrawal represented heat removed during passage of a hurricane. Difference analyses were constructed for the initial sea surface temperature at each station after twenty-four hours of simulated withdrawal. The differences ranged from less than one degree to over four degrees. Again, no consistent pattern was found but generally areas of high concentrations of heat experienced smaller decreases. Actual sea surface temperatures collected after two hurricanes were then analyzed and compared to temperature pattern predicted by the computer model. Illustrations of the relative availability of sensible heat energy for different sea surface temperatures are presented and a hypothesis made to account for the greater than average intensities of Hurricanes Betsy (1965) and Camille (1969). (Woodard-USGS)
W71-08347

CLOUD DEVELOPMENT AND DISTRIBUTION AROUND KHARTOUM,
Southern Oregon Coll., Ashland. Dept. of Geography.
R. M. Hammer.
Weather, Vol 25, No 9, p 411-414, Sept 1970. 3 fig, 2 ref.

Descriptors: *Clouds, *Rainfall, *Semiarid climates, *Climatic data, *Surface waters, Topography, Vegetation effects, Orography, Radar, Onsite investigations, Evaporation, Edge effect, Environmental effects, Winds, Mode of action.
Identifiers: *Cumulus clouds, *Cumulonimbus clouds, *Sudan, *Cloud distribution.

Mesoscale distributions of cumuliform clouds were mapped in the Khartoum region of the Sudan, and an attempt was made to evaluate cloud distribution in terms of surface features. Visual observations during the rainy seasons (1964-1965) indicated that about 95% of the first cumulus were concentrated in 2 major areas, one to the east and southeast around Khartoum, and the other west of Khartoum. Using radar and visual observation, areal distribution and development of showers was mapped. About 80% developed in the southeast quadrat and 15% slightly west. For various reasons, orographic effects, vegetation, and soil color were ruled out as primary causes of cloud development, while the distribution of water and irrigated surfaces presented a fairly close relationship to the cloud pattern. A possible causative mechanism might be the development of a cool moist dome over the water which in turn might cause an increased convergence of the surface wind along the west side of the dome, resulting in greater low-level cloud development. Perhaps man, through irrigation, has inadvertently enhanced shower development in the region. (Casey-Arizona)
W71-08449

SPACE-TIME VALIDATION OF A THUNDERSTORM RAINFALL MODEL,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. M. Fogel, L. Duckstein, and C. C. Kisiel.
Water Resources Bulletin, Vol 7, No 2, p 309-316, Apr 1971. 8 p, 3 fig, 2 tab, 9 ref. OWRR Project A-020 ARIZ (2).

Descriptors: *Probability, *Statistical models, *Rainfall, *Thunderstorms, *Illinois, Precipitation (Atmospheric), Frequency analysis, Distribution patterns, Urbanization, Cities, Rainfall-runoff relationships.
Identifiers: *Urban water resources, *Urban hydrology, Chicago (Illinois).

A probability model for predicting the occurrence and magnitude of thunderstorm rainfall developed in the southwestern United States was tested in the metropolitan Chicago area with reasonable success, especially for the moderate to the extreme runoff-producing events. The model requires the estimation of two paramenters, the mean number of events per year and the conditional probability of rain given that an event has occurred. To tie in the data from more than one gage in an area, an event can be defined in several ways, such as the areal mean rainfall exceeding 0.50 inch and at least one gage receiving more than 1.0 inch. This type of definition allows both of the model parameters to be obtained from daily warm-season rainfall records. Regardless of the definition used a Poisson distribution adequately described the number of events per season. A negative binomial distribution was derived as representing the frequency density function for rainfall where several gages are employed in defining a storm. Chicago data fit both distributions very well at events with relatively high return periods. The results indicate the possibility of using the model on a regional basis where limited amount of data may be used to estimate parameters for extensive areas. (Knapp-USGS)
W71-08530

HEAVY RAIN, HAIL, AND TORNADOES ON 15 MAY 1968,
Illinois State Water Survey, Urbana.
Stanley A. Changnon, and John W. Wilson.
Illinois Water Survey Report of Investigation 66, 1971. 48 p, 42 fig, 13 tab, 26 ref.

Descriptors: *Thunderstorms, *Illinois, *Synoptic analysis, *Tornadoes, *Cloudbursts, Cyclones, Disasters, Storm runoff, Turbulence, Storm structure, Flooding, Squalls, Weather patterns, Cloud physics, Lightning, Overland flow, Precipitation (Atmospheric), Anticyclones, Atmospheric pressure, Climatic data, Fronts (Atmospheric), Rainfall intensity, Wind velocity, Distribution patterns, Soil erosion.
Identifiers: *McLean County, *Dewitt County, *Platt County, Bloomington, Farmer City (Ill).

On 15 May 1968 a severe storm combining heavy rain, tornadoes, and extensive hail occurred and maximized over a 1765-square-mile dense raingage-hailpad and hail observer network in central Illinois. In a 14-hour period the network area had 4 major rain systems which included 19 thunderstorms (rain cells) and point rainfalls exceeding 10 inches, 113 hailstreaks with hail over 1664 square miles, and 6 tornadoes. Crop and property damages were extensive. One rain system was a gigantic steady-state storm that produced excessive rain rates, the tornadoes, and a design hailstreak which lasted 90 minutes with point durations up to 45 minutes, covered 788 square miles, and produced 2-inch hailstones. Rainfall rates for durations ranging from 15 minutes up to 6 hours easily exceeded 100-year point frequency values, and at its peak, the steady-state storm released 883 million cubic feet of water in one 15-minute period. Many synoptic weather conditions conducive to severe weather outbreaks existed in central Illinois on 15 May. All four rain systems maximized their rain, hail, and tornado production within a 1765-square-mile area. The conditions critical for severe weather formation had not altered their geographical position over a 6-hour period, a situation frequently necessary for the production of 10-inch or greater rainfalls in Illinois. (Glasby-USGS)
W71-08917

2C. Snow, Ice, and Frost

SOME ASPECTS OF EROSION AND SEDIMENTATION IN AN ARCTIC DELTA DURING BREAKUP,
Louisiana State Univ., Baton Rouge, and Office of Naval Research, London (England).
For primary bibliographic entry see Field 02J.
W71-08344

THE REMOTE SENSING OF THE SEA AND SEA ICE,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 07B.
W71-08364

METHODS OF CALCULATING SNOW COVER DENSITY IN THE KYZYLCHA MOUNTAIN RIVER BASIN (RUSSIAN: NEKOTORYYE SPOSOBY RASCHETOV PLOTNOSTI SNEZHNOGO POKROVA V BASSEYNE GORNOY REKI KYZYLCHA),
Yu. B. Sadvakasov, and Ye. M. Kozik.
Meteorologiya i Gidrologiya, No 11, p 77-82, Nov 1970. 1 fig, 5 tab, 3 ref.

Descriptors: *Snow cover, *Snow surveys, *River basins, Precipitation (Atmospheric), Air temperature, Meteorological data, Foreign research.
Identifiers: *USSR, Tyan'-Shan' Mountains.

Snow survey data for a six-year period (1960-1965) are used for finding methods to calculate snow cover density. Density of the snow cover is examined as a function of time and as a function of the amount of winter precipitation and air temperature. A comparison of the two methods shows that in 85 and 90% of the cases, respectively, absolute errors do not exceed 0.04 g/cu cm and that root mean-square errors are 0.031 g/cu cm. Additional studies are required to increase the accuracy of computations by accounting for the effect of meteorological factors. (Josefson-USGS)
W71-08370

LONG-RANGE FORECAST OF WATER FLOW TO THE KIEV RESERVOIR DURING SPRING HIGH-WATER PERIOD (RUSSIAN: DOLGOSROCHNYY PROGNOZ PRITOKA VODY ZA PERIOD VESENNEGO POLOVODOV'YA K KIYEVSKOMU VODOHRANILISHCHU),
For primary bibliographic entry see Field 04A.
W71-08375

ACCOUNTING FOR PEAK FLOW DURING HIGH-WATER PERIOD IN COMPUTATIONS AND FORECASTS OF A SPRING RUNOFF MAXIMUM (RUSSIAN: OB UCHETE DRUZHNOSTI RAZVITIYA POLOVOD'YA V RASCHETAKH I PROGNOZAKH VESENNEGO MAKSIMUMA),
For primary bibliographic entry see Field 04A.
W71-08377

RATES OF MELT WATER FLOW ALONG SLOPES (RUSSIAN: O SKOROSTYAKH STEKANIYA TALOY VODY PO SKLONAM),
For primary bibliographic entry see Field 04A.
W71-08380

THE URBAN SNOW HAZARD: ECONOMIC AND SOCIAL IMPLICATIONS,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 06B.
W71-08493

EXPERIENCE WITH THE USE OF TURBO-DRILL INSTALLATIONS IN HYDRAULIC CONSTRUCTION,
G. F. Biyanov, and L. N. Toropov.
Hydrotechnical Construction, No 3, p 217-220, Mar 1970. 4 p, 4 fig, 2 ref.

Descriptors: *Cold weather construction, Arctic, *Thawing, Snow, *Snow removal, Foreign construction, Frozen soils, Construction, Cutoffs, Ice, Foundations, Concrete placing, Soil compaction, Mobile equipment, Cutoff trenches, Rockfill dams, Permafrost, Safety, Foreign design practices.
Identifiers: *Turbojet engines, Viliuisk Dam and Yerpit (USSR), USSR, *Ice removal.

High temperature exhaust gases from turbojet engines were used in the USSR for thawing and drying frozen soils during construction at the Viliuisk hydroelectric installation. Turbojet equipment was installed on the left bank of the river near the trench and dam cutoff for thawing 20,000 cu m of frozen loam to be placed in the cutoff and core of the dam. In addition to stationary installations, turbojet engines were mounted on caterpillar or wheeled chassis for removing snow and ice from fills or used in stripping rock foundations in preparation for concrete placement. The experiences encountered at the Viliuisk installation demonstrated that the turbojet equipment can be used successfully for different construction operations on hydraulic construction work in Arctic regions. (USBR)
W71-08632

PHYSICAL PROPERTIES OF ALPINE SNOW AS RELATED TO WEATHER AND AVALANCHE CONDITIONS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
E. Martinelli, Jr.
USDA Forest Serv. Res. Pap RM-64, 35 p, illus.

Descriptors: *Avalanches, *Snowpacks, *Snow, Snow cover, Crystals, Climatic data, Weather data, Colorado, Bulk density, Porosity.
Identifiers: *Alpine, *Slab avalanches, Physical properties, Snow crystals, Avalanche starting zones.

Data were taken in avalanche starting zones at 11,700 feet in Front Range of Colorado within 14 days of deposition. Densities varied from 40 to 450 kg m-3. A statistical criterion was used to identify snow with unusually high density for its age (initial hard slab) and unusually low (persistent soft snow). Initial hard slab, found in 15 percent of the pits, was correlated with moderate to high windspeeds, low temperatures, and blowing snow. No way was found to distinguish initial hard slab from dense older snow. Tensile strength varied from 1.0 to 712 grams force cm-2. Strength increased with density but varied greatly. Younger snows were weaker than older snows of same density. Strength was also measured with shear box and shear vane. Ram resistance was higher for alpine snow than for snow of same density in trees. Air permeability was 1 order of magnitude less than expected and varied with low flow rate used. The ratio virtual porosity/porosity, which averaged 1.062, was of little value for identifying wind slab. Strength of snow of given density was greater for a certain permeability (texture) than for any other.
W71-08840

SEASONAL SNOW COVER AND DISPOSITION OF SNOWMELT RUNOFF IN CENTRAL COLORADO,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
For primary bibliographic entry see Field 03B.
W71-08844

MEASURING ILLUMINATION WITHIN SNOW COVER WITH CADMIUM SULFIDE PHOTO RESISTORS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
For primary bibliographic entry see Field 02D.
W71-08849

TERRAIN AND COVER EFFECTS ON SNOWMELT IN A WESTERN WHITE PINE FOREST,
Intermountain Forest and Range Exp Station, Logan, Utah.
For primary bibliographic entry see Field 04C.
W71-08854

BIBLIOGRAPHY ON NORTHERN SEA ICE AND RELATED SUBJECTS,
Canada Ministry of Transport, Ottawa (Ontario). Marine Operations; and Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
J. D. Bradford, and S. M. Smirle.
Canada Ministry of Transport and Dept of Energy, Mines and Resources Cooperative Bibliographic Report, Jan 1970. 188 p.

Descriptors: *Bibliographies, *Publications, *Information retrieval, *Sea ice, *Navigation, Icebergs, Oceans, Documentation, Ships, Libraries.
Identifiers: *Northern sea ice.

This bibliography contains the references cited to subjects which have a bearing on the operation of ships in ice. While geographically the emphasis is Canadian, works which describe foreign experience in northern sea ice research and technology are included. References to literature on ice islands, ice shelves and icebergs are only included if information on sea ice movement is provided. Initially, the references were gathered from recent sea ice literature. To these were added the relevant holdings of the following libraries: Department of Transport; National Science Surveys and Mapping Branch, Department of Energy, Mines and Resources; Water Sector, Department of Energy, Mines and Resources; Defence Research Board (Geophysics); Arctic Institute of North America; Stefansson Collection, Dartmouth College, U.S. Army, Cold Regions Research and Engineering Laboratory; and Massachusetts Institute of Technology. (Woodard-USGS)
W71-08920

2D. Evaporation and Transpiration

THE EFFECTS OF ANTITRANSPIRANT CHEMICALS ON THE TRANSPIRATION AND PHYSIOLOGY OF TAMARIX SPECIES,
Arizona Univ., Tucson. Dept. of Watershed Management.
Kenneth Norman Brooks.
Arizona University, PhD Dissertation, 1970. 84 p, 17 fig, 20 tab, 75 ref. OWRR Project A-018-ALA (1).

Descriptors: *Phreatophytes, *Tamarisk, *Stomata, *Water conservation, *Chemcontrol, Laboratory tests, Environmental effects, Plant physiology, Mode of action, Transpiration, Leaves, Photosynthesis, Respiration, Arid lands, Plant growth, Temperature, Foliar application.
Identifiers: *Antitranspirants, *Leak temperatures.

In the water-short southwest, certain phreatophyte species have been highly controversial. Because these plants exploit the water table and have high transpiration rates, expensive eradication programs have often been employed. However these have been opposed for esthetic and wildlife conservation reasons. If suitable antitranspirants were developed, perhaps water use could be decreased without plant destruction. Using tamarisk (Tamarix pentandra Pall.) and athel tree (T. aphylla L.), several antitranspirants were subjected to greenhouse study and the potentially effective compounds given further detailed study. Spray applications of 0.01 M 8-hydroxyquinoline sulfate and a combination of 150 ppm mono-methyl and 150 ppm mono-glyceryl esters of N-decenylsuccinic acid in Triton X-100 solutions reduced daily transpiration rates 28-36% for 20 days. Both applications reduced tamarisk stomatal apertures significantly, and reduced growth rates for 10-20 days. The decreased growth rates may have caused the reduced transpiration rates. Foliage analyses showed no effect on chlorophyll and protein contents. Transpiration rates of potted field tamarisks were reduced for only 5 days, but this may have been affected by rainfall on the fifth day. The data indicates that tamarisk transpiration may be substantially reduced by antitranspirants through growth reduction without lethal increases in foliage temperature. (Casey-Arizona)
W71-08469

THE ENERGY BUDGET OF MAN AT HIGH ALTITUDES,
California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung.
International Journal of Biometeorology, Vol 14, No 1, p 13-43, 1970. 30 fig, 19 ref.

Descriptors: *Arid lands, *Mountains, *Solar radiation, *Energy budget, *Model studies, Environmental effects, On-site investigations, Climatic data, Altitude, Estimating equations, Seasonal, Diurnal, Air temperature, Albedo, Air masses, Snow cover, Climatic zones, California, Evaporation, Correlation analysis, Convection.
Identifiers: *Radiation climatology, *Optical airmass, *Sweating.

The greatest solar radiation intensities on this planet may occur during the summer in arid region high mountain ranges of the lower middle latitudes, such as the White Mountain Range of California. Attempts were made to link the physical energy balance climatology of the area to the human energy balance climatology along an altitudinal transect. Energy balance equations relating radiation to evaporation, sensible heat flux and soil heat flux are developed for physical-horizontal surfaces and human surfaces. The direct beam solar radiation on a horizontal surface could be roughly described by an exponential function of elevation that varied with time while the radiative lapse was an approximate negative exponential function of the sun zenith angle. A plot of the ratio of direct beam (or diffuse) solar radiation to available energy on top of the atmosphere vs. optical airmass showed a good-fitting linear relationship, creating a highly predictive method for deducing the midsummer radiation climatology of the area. Air temperature proved a poor measure of the conditions affecting man. The human net radiation pattern was inverse to the diurnal radiation pattern for the horizontal-physical surface. The data was used to test 2 variations of a model predicting human net radiation at high elevations: a summer model and a simulation model for the whole year. The predictive abilities for both models were high and their construction yielded several insights. Vertical man probably receives more than half of the reflected diffuse solar radiation and the relatively high amounts of human net radiation could be drastically reduced by stepping under a tree. At the peak of human net radiation, evaporation (sweating) was activated to share the burden of heat disposal with the sensible heat fluxes. (Casey-Arizona)
W71-08473

A NIGHTTIME ENERGY AND MOISTURE BUDGET IN DEATH VALLEY, CALIFORNIA, IN MID-AUGUST,
California Univ., Los Angeles. Dept. of Geography.
Werner H. Terjung, Simon O. Ojo, and Stanley W. Swarts.
Geografiska Annaler, Vol 52A, No 3-4, p 160-173, 1970. 17 fig, 1 tab, 26 ref.

Descriptors: *Deserts, *Energy budget, *Solar radiation, *Evaporation, *Climatic data, Environmental effects, Advection, Ecosystems, Air temperature, Soil temperature, Albedo, Dew, Convection, Conduction, Infrared radiation, Wind velocity, Model studies, Estimating equations, On-site investigations, Vapor pressure, Diurnal distribution.
Identifiers: *Mojave Desert, *Death Valley, *Moisture budget, *Net radiation, *Bowen ratio, Radiation efficiency.

Basic observational data on the diurnal regime of radiation budgets and their observed phenomena were obtained over 20 hr. of a hazy August day in Death Valley. The basic energy budget equations are developed, their physical components described, and measurement techniques reviewed. Total environmental radiant temperature (Tsube) is more important in determining organism heat gain or loss than the popularly used air temperature. Tsube is one-half the sum of bare soil and sky temperatures. Desert vegetation surface temperatures, compared with bare surface temperatures, were lower during the day and higher at night. Soil temperatures were considerably higher during the night than actual surface temperature. During the night, steady infrared radiation loss resulted in a negative net radiation ratio (-0.13 ly/min) and the resulting energy budget deficit was satisfied by heat flux out of the ground. Little nighttime evaporation occurred except when high wind speeds created advective effects interrupting dew deposition. A theoretical net radiation model developed by Sellers and Budyko was tested against the observed data and excellent agreement was found. Parts of the model were expanded and again agreed well with observations. Net radiation and other energy budget data could therefore have been obtained from meteorological data commonly available at major weather stations. (Casey-Arizona)
W71-08480

SOME PHYSICAL ASPECTS OF WATER RESOURCE DEVELOPMENT IN TANZANIA,
University Coll., Dar-es-Salaam (Tanzania). Dept. of Geography.
Ian J. Jackson.
Geografiska Annaler, Vol 52A, No 3-4, p 174-185, 1970. 5 fig, 10 tab, 40 ref.

Descriptors: *Rainfall, *Evapotranspiration, *Climatic data, *Water resources development, *Water requirements, Crops, Research and development, Hydrological cycle, Rainfall disposition, Data collections, Land use, Variability, Semiarid climates, Stemflow, Sediment yield, Streamflow, Forests, Runoff, Vegetation.
Identifiers: *East Africa, *Tanzania, *Potential evapotranspiration.

Tanzania is mainly an agricultural country with limited water resources and seasonal rainfalls. Climatic zones range from the coastal humid areas to large semiarid regions. The relief and annual regional rainfalls of the country are described. Rainfall variability has a drastic effect on agriculture and only half the country has a threshold 750 mm rainfall per year with 80% probability. The Penman method of determining potential evapotranspiration has proved to be the most accurate. Despite uncertainties it appears that evaporation rates are high in relation to rainfall. Spatial and temporal variations of rainfall are analyzed. Particularly important are the evaporative demand/crop water requirement ratios in differing regions for differing crops. A number of experiments in catchment areas on land use impact have yielded important results. Dense forests are excellent catchment areas, and the replacement of bamboo by softwood does not produce permanent effects on runoff or sediment yield, while replacement of high forests by tea plantations may increase runoff by 15%. Soil erosion becomes a serious problem in cultivated catchments and must be balanced against water loss by tree transpiration. An overgrazed region with more than 750 mm/yr rainfall may have vegetation characteristic of arid regions. Much data is urgently needed and promising research projects are outlined. (Casey-Arizona)
W71-08483

RESEARCH RELATES WEATHER TO NEBRASKA WATER USE,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
Norman J. Rosenberg.
Nebraska Farm, Ranch and Home Quarterly, Vol 16, No 2, Summer 1969, p 25-28. 2 tab, 3 fig.

Descriptors: *Transpiration, *Evapotranspiration, *Lysimeters, *Instrumentation, *Soil-water-plant relationships, Weather, Nebraska, Evaporation, Great Plains, Water vapor, Water transfer, Energy budget, Sprinkler irrigation, Flood irrigation, Meteorology, Experimental farms, Solar radiation, Soil temperature, Wind velocity, Humidity, Elevation, Soil properties, Water demand, Consumptive use, Atmospheric physics, Alfalfa, Crop production, Windbreaks, Evaporation control.
Identifiers: Net radiation, Soil heat flux, Data loggers.

Research is described which relates weather conditions to evaporation and plant water use in the Great Plains of eastern Nebraska. Basic principles of evaporation, evapotranspiration, lysimeters, water vapor transfer, and energy budgets are discussed. Energy budgets for eastern and western states are contrasted according to evapotranspiration regimes. Precision weighing lysimeters were installed on a sprinkler and flood-irrigated 5-acre plot at the University of Nebraska Field Laboratory at Mead in 1966. Water evaporated in a 15-minute period can be accurately measured. Meteorological instruments at the site measure solar and net radiation, soil heat flux, wind speed and direction, temperature and humidity at various elevations, and soil and plant temperatures. Instrumentation is linked together by data loggers, which are computer compatible. Quality checking and analysis generates important data on radiation balance and heat transport. A computer plotter graphs functional relationships between measured parameters. The water demand of consumptive crops and atmospheric processes are studied. Evapotranspiration is highest in the late spring and early summer because of hot winds. Evaporation is highest in the daytime, and continues at night as soils release energy. These studies will be useful for optimum water use on alfalfa and other crops. Other experiments on water use efficiency, anti-transpirant chemicals, reflectant materials, and windbreaks will be conducted. Figures and tables show a precision lysimeter, meteorological sensors, data loggers, and energy balance and nocturnal evapotranspiration data sheet. (Popkin-Arizona)
W71-08490

MEASURING ILLUMINATION WITHIN SNOW COVER WITH CADMIUM SULFIDE PHOTO RESISTORS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
James D. Bergen.
USDA Forest Serv Res Note RM-181. 4 p.

Descriptors: *Snow, *Solar radiation, *Snowpacks, *Photometry, Colorado, Snow cover, Light intensity, Solar radiation.
Identifiers: *Photo resistors, *Cadmium sulfide, Light attenuation, Turbidimetry.

Light-sensitive cadmium sulfide resistors can measure the downward flux of sunlight in the snow cover. When the variation of sensor response and the absorptivity of ice are considered together with the approximate distribution of energy in the solar spectrum, the variation of cell resistance (R) is estimated by 4.55/RE.925 — 2.1 X.925 .. X3.27 where (E is the total incident radiation at the snow surface and (X) is the average attenuation ratio for radiation between 0.5 microns and 0.7 microns. The last term becomes negligible for values of XA0.3.
W71-08849

ESTIMATING EVAPOTRANSPIRATION - AN EVALUATION OF TECHNIQUES.
Australian Water Resources Council, Canberra.

Australian Water Resources Council Hydrological Series No 5, 1970. 23 p, 49 ref.

Descriptors: *Evaporation, *Energy budget, *Evapotranspiration, *Analytical techniques, Estimating, Evaluation, Data collections, Lysimeters, Equations, Instrumentation, Costs, Water balance, Advection.
Identifiers: *Australia.

Several Australian techniques for measuring evaporation from natural surfaces are described. The three main techniques involve determination of (1) the evaporation term in the water balance, (2) the latent heat term in the energy balance, and (3) the net upward flow of water vapor in the air layers near the gound. In addition, methods developed involving combinations of (2) and (3) and a number of procedures developed for empirically calculating E from measured meteorological variables are discussed. At present the method suitable for the measurement of evaporation, from most types of land surfaces, appears to be that based on the evaluation of the surface energy balance. (Woodard-USGS)
W71-08930

2E. Streamflow and Runoff

FLOODS IN WILMINGTON QUADRANGLE NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08332

FLOODS IN HUNTLEY QUADRANGLE NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08334

FLOODS IN HEBRON QUADRANGLE NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08335

FLOODS IN VICINITY OF ELLIJAY, GEORGIA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08336

FLOODS IN THE YABUCOA AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08337

FLOODS IN CHANNAHON QUADRANGLE NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08338

APPLICATION OF AERIAL PHOTO INTERPRETATION METHODS IN HYDROLOGICAL STUDIES WITH SPECIAL REFERENCE TO THE PROBLEMS IN EASTERN INDIA,
Geological Survey of India, Calcutta.
For primary bibliographic entry see Field 07B.
W71-08341

WATER RESOURCES OF EAST BIHAR RIVERS,
Bihar State Irrigation Commission, Patna (India).
A. Das Gupta, and S. D. N. Verma.
Indian Geohydrology, Vol 5, No 1, p 50-57, 1969. 8 p, 1 fig, 5 tab.

Descriptors: *Water resources development, *River basin development, *Data collection, Hydrologic data, Runoff, Streamflow, Drainage, Watershed management, Reservoirs, Water supply, Streamflow forecasting.
Identifiers: Bihar (India).

Water resources of East Bihar (India) rivers largely remained untapped. Except for the M

shi, Badua and Chandan reservoir projects, no
er major projects have been built so far in East
ar. Assessment of water resources of the Ajoy,
mani, Chandan, Badua and Chir rivers was
de with the available rainfall and discharge data.
relationship between historical runoff and ef-
ive rainfall was derived for these river basins.
centage availability of runoff was determined,
the water potential of the basins for irrigation
worked out and presented in tables. (Knapp-
GS)
1-08342

AINAGE PATTERN ANALYSIS, SOUTHERN
H PLAINS, WEST TEXAS AND EASTERN
W MEXICO,
as Technological Coll. Lubbock. Dept. of
sciences.
primary bibliographic entry see Field 02F.
1-08354

VELLING, COLUMBIA RIVER PLUME AND
BACORE TUNA,
gon State Univ., Corvallis. Dept. of Oceanog-
y.
primary bibliographic entry see Field 07B.
1-08358

RARED EXPLORATION FOR SHORELINE
INGS AT MONO LAKE, CALIFORNIA,
T SITE,
orado School of Mines, Golden. Dept. of
logy.
primary bibliographic entry see Field 07B.
-08359

E-SPACE VARIATIONS OF THE GULF
EAM AS OBSERVED BY AIRBORNE
MOTE SENSING TECHNIQUES,
al Oceanographic Office, Washington, D.C.
primary bibliographic entry see Field 07B.
-08366

CULATION OF FLOWS DURING SUDDEN
W EXPANSION (RUSSIAN: RASCHET
HENIY PRI VNEZAPNOM RASSHIRENII
OKA),
ngradskii Institut Inzhenerov Vodnogo Trans-
a Moscow (USSR).
primary bibliographic entry see Field 08B.
-08371

SIDERATION OF LOSSES IN COMPUTING
SPRING HIGH-WATER HYDROGRAPH
SSIAN: UCHET DINAMIKI POTER'PRI
CHETE GIDROGRAFA VESENNEGO
OVOD'YA),
Koren, and V. A. Bel'chikov.
orologiya i Gidrologiya, No 11, p 65-69, Nov
. 1 fig, 8 ref.

riptors: *Hydrographs, *Model studies, Infil-
n, Soil moisture, River basins, Freezing, Ru-
Precipitation (Atmospheric), Frozen soils.
ifiers: *USSR, Ice crust.

putation of a spring high-water hydrograph is a
ssive calculation of water inflow, water loss
he movement of water along slopes and chan-
To select a model for computing water infil-
n the following factors are considered: (1) the
onship between losses and soil moisture and
ng depth; (2) the constancy of loss with in-
ed soil moisture and freezing depth; (3) the
ed infiltration rate at end of snow melt; and
e effect of an ice crust on the character of in-
ion. Two small rivers--the Seym and Oka--are
to test the model. Five flood periods are
ed for each basin for obtaining optimal
neters. Except for ice crust and basin wetness
arameter values derived from optimization are
close for the two basins. (Josefson-USGS)
-08372

MATHEMATICAL MODELS OF STREAMFLOW TRANSFORMATION AND METHODS OF DETERMINING THEIR PARAMETERS (RUSSIAN: MATEMATICHESKIYE MODELI PROTESSA TRANSFORMATSII RECHNOGO STOKA I METODY OPREDELENIYA IKH PARAMETROV),
Yu. M. Denisov, and I. D. Shentsis.
Meteorologiya i Gidrologiya, No 11, p 58-64, Nov 1970. 2 fig, 4 tab, 4 ref.

Descriptors: *Mathematical models, *Streamflow, *River basins, *Input-output analysis, Least squares method, Foreign research, Melt water, Rain water, Discharge (Water), Aquifers, Runoff.
Identifiers: *USSR, Akhangaran River, Mountain basins.

A river basin is viewed as a dynamic system whose input is the flow of snowmelt and rain water onto a basin surface and whose output is the discharge of water at the outlet. In view of differences in the conditions and character of water movement on surfaces and in variously located aquifer horizons, a mountain basin is presented in the form of several reservoirs (layers) located one under the other and connected in series-parallel mode. It is assumed that water moves out of reservoirs into underlying reservoirs as well as from each reservoir into the outlet. Two methods are used to find optimal parameter values for mathematical models of streamflow transformation by a mountain basin--the least squares method and a combination method involving a one-volume nonlinear and a two-volume linear model. The combination method is preferred in determining model parameters for the Akhangaran River for the period 1957-1963. (Josefson-USGS)
W71-08373

PROBLEMS OF HYDROLOGIC FORECASTS AND COMPUTATIONS (RUSSIAN: VOPROSY GIDROLOGICHESKIKH PROGNOZOV I RASCHETOV),
For primary bibliographic entry see Field 04A.
W71-08374

POSSIBILITIES OF FORECASTING DNIESTER RIVER SPRING RUNOFF (RUSSIAN: VESENNIY STOK DNESTRA I VOZMOZHNOST' YEGO PROGNOZA),
A. V. Shcherbak.
In: Voprosy gidrologicheskikh prognozov i raschetov, Ukrainskiy Nauchno-Issledovatel' skiy Gidrometeorologicheskiy Institut Trudy, No 76, p 43-55, 1969. 4 fig, 5 tab, 14 ref.

Descriptors: *Runoff forecasting, *Snowmelt, *Rainfall-runoff relationships, *Discharge (Water), Melt water, Air temperature, Seasonal, Precipitation (Atmospheric), Climatic data, Tributaries, River forecasting, Surface-groundwater relationships.
Identifiers: *Ukraine, Dniester River, Snow storage, Spring runoff.

An analysis was made of the formation conditions of spring runoff in the Dniester basin for determining the possibility of preparing forecasts. The spring runoff used was that formed mainly by the melting of snow after air temperature had finally risen above the 0 deg C mark. Spring runoff from the Dniester River was separated into its component parts according to recharge. The meltwater component in the total Dniester spring runoff was 54% and the groundwater and rain component 22 and 24%, respectively. A major role in the formation of Dniester spring runoff was assumed by Carpathian river tributaries, with little participation by the left bank of the basin, which covered 66% of the basin area. A relationship was established between Dniester spring runoff and snow storage by time of snowmelt and precipitation during the high-water period. The computed value of snow storage and precipitation in the basin was determined by their participation in total spring runoff. It was also established that fall wetting in the Dniester basin had no appreciable effect on the magnitude of spring runoff. Use of the relationship obtained was complicated by the impossibility of arriving at an accurate estimate of the precipitation which would occur during a runoff formation period. It is suggested that a forecast of maximum spring inflow for the Dniester be prepared and then refined on the basis of the actual amount of precipitation after start of spring runoff. (See also W71-08374) (Josefson-USGS)
W71-08379

OPTIMAL LENGTH OF REACH AND TIME INTERVAL IN COMPUTATIONS OF UNSTEADY MOVEMENT OF WATER USING THE METHOD OF G. P. KALININ AND P. I. MILYUKOV (RUSSIAN: OPTIMAL'NYYE DLINA UCHASTKA I INTERVAL VREMENI PRI RASCHETAKH NEUSTANOVIVSHEGOSYA DVIZHENIYA VODY PO METODU G. P. KALININA I P. I. MILYUKOVA),
For primary bibliographic entry see Field 04A.
W71-08390

NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W71-08392

FLOODS OF SEPTEMBER 1970 IN ARIZONA, UTAH, AND COLORADO,
Geological Survey, Phoenix, Ariz.
R. H. Roeske.
Arizona Land Department Water Resources Report, No 44, Apr 1971. 20 p, 1 tab.

Descriptors: *Floods, *Flood damage, *Arizona, *Utah, *Colorado, Rainfall, Runoff, Streamflow, Stream gages, Hydrologic data, Data collections, Flow rates, Discharge measurement, Peak discharge, Flood plains, Meteorological data.
Identifiers: *Arizona floods (1970).

Record floods occurred in Arizona, southeastern Utah, and southwestern Colorado on September 4-7, 1970. The floods took the lives of 25 persons and caused millions of dollars in property damage. The heaviest rainfall occurred in the mountainous areas of central Arizona. Numerous precipitation stations recorded 5 to 8 inches of rainfall in 24 hours, and one station recorded 11.40 inches, which is an alltime record for 24-hour precipitation in Arizona. Two separate peaks of nearly equal stage occurred at Tonto Creek above Gun Creek near Roosevelt. The discharge at the higher stage was 53,000 cfs, which is the highest discharge recorded since the station was established in 1940. The records from two old staff gages at downstream sites indicate this might be the highest peak since the early 1900's. All flow from Tonto Creek was stored in the Salt River reservoirs. A similar storm, but of lesser magnitude, struck southeastern Utah and southwestern Colorado September 12-14, 1970. The largest total 3-day precipitation reported for this storm was 4.83 inches, and the largest 24-hour total reported was 2.84 inches. (Woodard-USGS)
W71-08519

THE ACOUSTIC STREAMFLOW-MEASURING SYSTEM ON THE COLUMBIA RIVER AT THE DALLES, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 07B.
W71-08522

SURFACE WATER DATA--ATLANTIC PROVINCES, 1968.
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 07C.
W71-08524

OPEN-CHANNEL INTEGRATING-TYPE FLOW METER,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 07B.
W71-08525

GEOLOGICAL SURVEY RESEARCH 1970, CHAPTER A.
Geological Survey, Washington, D.C.

For sale by the Superintendent of Documents, US Government Printing Office, Wash, DC, 20402 - Price $4.00. Geological Survey Professional Paper 700-A, 1970. 426 p, 10 fig.

Descriptors: *Bibliographies, *Reviews, *Water resources, Hydrogeology, Mineralogy, Geology, Projects, Resource development, Research and development, Water resources development, Groundwater, Surface waters, Water quality.
Identifiers: *U.S. Geological Survey, *Water resources research.

'Geological Survey Research 1970,' the eleventh annual review of the economic and scientific work of the U.S. Geological Survey, consists of four chapters (A through D) of Professional Paper 700. Chapter A summarizes significant results, and the remaining chapters consist of collections of short technical papers. The purpose of the volume is to make available promptly to the public many of the highlights of Survey research and investigations. USGS reports are listed in 'Publications in Fiscal Year 1970'. If a summary statement is the result of collaboration with a colleague from outside the Survey, the colleague's current organization (such as a university) is indicated in parentheses immediately following his name in the text. (Knapp-USGS)
W71-08532

WATER RESOURCES OF THE RIVER ROUGE BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Washington, DC.
For primary bibliographic entry see Field 07C.
W71-08535

FLOODS IN THE ANASCO AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W71-08536

DEVELOPMENT OF WATER RESOURCES IN THE KHMER REPUBLIC.
Economic Commission for Asia and the Far East, New York.
For primary bibliographic entry see Field 04A.
W71-08546

OBSERVATIONS OF THE EFFECT OF EXTREME HIGH WATER IN 1965 AND 1966 ON THE GROUNDWATER BODY OF THE LIENZ BASIN-EAST TIROL (GERMAN: BEOBACHTUNGEN UBER DIE AUSWIRKUNG DER EXTREMEN HOCHWASSER 1965 UND 1966 AUF DEN GRUNDWASSERKORPER IM BECKEN VON LIENZ (OSTTIROL),
For primary bibliographic entry see Field 02A.
W71-08580

HYDROLOGIC DATA UTILIZATION IN FORECASTING THE SPRING 1969 MIDWEST SNOWMELT FLOODS,
Environmental Science Services Administration, Kansas City, Mo., Weather Bureau River Forecast Center.
Herman F. Mondschein.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 468-481, 1970. 14 p, 5 fig, 2 tab, 11 ref.

Descriptors: *Flood forecasting, *Snowmelt, *Rainfall-runoff relationships, *Data processing, *Warning systems, Mississippi River Basin, Digital computers, Monitoring, Snowpacks, Flood damage, Runoff, Floods.
Identifiers: *Midwestern U.S.

The causes of the 1969 upper Midwest spring floods began in October 1968, when rainfall two and three times normal soaked several states in the area. In mid-December snows occurred at frequent intervals and before Christmas more than 2 feet was reported at several locations from Kansas to Minnesota. Succeeding months brought additional snow and freezing rain, further increasing the amount of stored water in the snowpack. In spring, snowmelt was rapid, and flooding was severe, widespread, disastrous and of record breaking proportions in a number of widely separated localities from southern Nebraska to westcentral Minnesota. This paper describes the treatment of hydrologic and meteorologic data in the preparation of river stage and flood forecasts by the Kansas City River Forecast Center of ESSA Weather Bureau, both prior to and during this flood. The application of digital computer technology to this problem is emphasized. (See also W71-08550) (Knapp-USGS)
W71-08893

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR ESCONDIDO CREEK, SAN ANTONIO RIVER BASIN, TEXAS--1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-08903

EDDY FORMATION BEHIND CIRCULAR CYLINDERS,
California Univ., Berkeley. Dept. of Mechanical Engineering.
Alan D. Laird.
Partially supported by National Science Foundation. ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY6, Paper 8170, p 763-775, June 1971. 13 p, 4 fig, 1 tab, 24 ref, append.

Descriptors: *Turbulent flow, *Eddies, *Vortices, *Flow around objects, Hydraulics, Hydraulic structures, Piers, Hydraulic models, Hydrodynamics.
Identifiers: *Flow around cylinders.

Eddies formed in the wake of a cylinder in cross flow are explained. Potential flow theory is used to demonstrate basic tendencies resulting from the behavior of shear layers and vortices under a variety of conditions prevailing in actual flows. Eddies are shed alternately behind a cylinder and form Karman vortex streets, as a combination of vorticity emanating from the boundary layers and the instability of these layers due to their vorticity. Potential flow theory gives useful predictions of flow about bluff cylinders. Shear layers are readily disintegrated by flow disturbances. The effects of vorticity in boundary layers on other regions apparently can be approximated by the effects of disturbed finite vortices in the potential theory modelling of flow about cylinders. (Knapp-USGS)
W71-08910

FLOOD PLAIN INFORMATION-WEST BRANCH BRANDYWINE CREEK.
Corps of Engineers, Philadelphia, Pa.
For primary bibliographic entry see Field 04A.
W71-08911

ON THE SPECTRUM OF SEA LEVEL AT OAHU,
National Inst. of Oceanography, Wormley (England); and Cambridge Univ. (England). Dept. of Applied Mathematics.
M. S. Longuet-Higgins.
Journal of Geophysical Research, Vol 76, No 15, p 3517-3522, May 20, 1971. 6 p, 3 fig, 16 ref. NSF Grant GA-1452.

Descriptors: *Tides, *Water level fluctuation *Hawaii, Tidal effects, Frequency analysis, Statis cal methods, Fourier analysis.

The cospectrum of sea level at Honolulu a Mokuoloe has noticeable peaks at frequencies 0.73, 0.50, 0.35, and 0.25 c/d (cycles per da Some possible causes are discussed. The bro band near 0.73 c/d may be the local manifestati of inertial, or near-inertial currents generated winds in the vicinity of Oahu. Because of frequency and phase, the peak at 0.50 c/d is no free mode of the Pacific. Most probably represents topographic Rossby wave trapped local topography round the island. Though it m be coupled subharmonically to the tides, it is m likely generated by local wind-stresses. The pe at 0.35 and 0.23 c/d may represent the low modes of the Pacific Ocean basin. But these m tions may also be due to local weather, resonance with trapped oscillations. (Kna USGS)
W71-08912

MIXING IN THE SURF ZONE,
Scripps Institution of Oceanography, La Jo Calif.
D. L. Inman, R. J. Tait, and C. E. Nordstrom.
Journal of Geophysical Research, Vol 76, No 1 3493-3514, May 20, 1971. 22 p, 12 fig, 5 tab, ref.

Descriptors: *Waves (Water), *Surf, *Mix *Tracers, *Dye releases, Turbulence, Oc waves, Ocean currents, Littoral drift, Advect Turbulent flow.
Identifiers: Longshore currents.

Two important mixing mechanisms are opera within the surf zone, each having distinctive le and time scales determined by the intensity o waves and the dimensions of the surf zone. The is associated with the breaking wave and its b which produce rapid mixing in an on-offs direction. This mixing, when normalized averaged over the surf zone width, gives co cients of eddy diffusivity. The second process i vective and is associated with the longshore an current systems in the nearshore circulation For constant longshore discharge of water bet cells, this process gives a concentration down rent from a continuously injected source of dy an approximation, the concentration decrease ponentially with distance from the injection p This relation gives an apparent longshore eddy ing coefficient proportional to the longshore rent velocity.
W71-08914

ANNUAL COMPILATION AND ANALYSI HYDROLOGIC DATA FOR GREEN CR BRAZOS RIVER BASIN, TEXAS--1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C
W71-08918

FLOOD CONTROL STUDY OF RIO GRA DE MANATI, MANATI AND BARCELON PUERTO RICO.
Flavio Acaron and Associates, San Juan (P Rico).
For primary bibliographic entry see Field 04A
W71-08919

CATALOG OF INFORMATION ON W DATA, EDITION 1970 - INDEX TO AREA VESTIGATIONS AND MISCELLAN WATER DATA ACTIVITIES.
Geological Survey, Washington, D. C. Off Water Data Coordination.
For primary bibliographic entry see Field 07C
W71-08922

RECONNAISSANCE OF THE BLACK RIV COLD-WATER RIVER IN THE NORTH

L PART OF MICHIGAN'S SOUTHERN
INSULA,
ogical Survey, Washington, D.C.
rimary bibliographic entry see Field 07C.
-08925

ONNAISSANCE OF THE STURGEON
R, A COLD-WATER RIVER IN THE
TH-CENTRAL PART OF MICHIGAN'S
THERN PENINSULA,
ogical Survey, Washington, D.C.
rimary bibliographic entry see Field 07C.
08926

ROLOGIC DATA: 1968, VOLUME 4, SAN
QUIN VALLEY.
rnia State Dept. of Water Resources, Sacra-
o.
rimary bibliographic entry see Field 07C.
08927

ROPOSED STREAMFLOW DATA PRO-
M FOR NORTH CAROLINA,
gical Survey, Raleigh, N.C.
rimary bibliographic entry see Field 07A.
08932

ER RESOURCES OF THE BIG CREEK
NAGE BASIN,
io Water Resources Commission, Toronto
rio). Div. of Water Resources.
/akutchik, and W. Lammers.
io Water Resources Commission, Water
rces Report 2, 1970. 172 p, 56 fig, 8 map, 39
2 ref.

iptors: *Water resources development,
mflow, *Groundwater, *Water utilization,
quality, Irrigation water, Water balance,
management (Applied), Data collections,
logic data, Hydrogeology.
iers: *Ontario (Canada), Big Creek Basin
rio).

dwater and surface water resources of the
eek Basin, Ontario, were evaluated in terms
ntity, quality, occurrence and use. The vari-
drologic parameters were examined and a
ogic budget is presented. Precipitation
es about 37 inches per year and is generally
ute. During extended dry periods in the
er, irrigation is practiced to overcome
re deficiencies. Groundwater supplies are
ant in the sand deposits that cover a large
f the basin. Other supplies are also available
h in the overburden and in the upper part of
drock. Groundwater runoff was calculated to
t to about seven inches annually and main-
table base flows in the streams. The water is
lly of good quality and is used extensively for
tic and irrigation purposes. Surface-water
s are generally abundant except during the
on period. During this period extensive
awals of water seriously deplete the stream-
s much as 70 per cent on maximum days.
l runoff ranged from 6.8 to 14.7 inches dur-
below-normal precipitation period from Oc-
962 to September 1967. (Knapp-USGS)
9935

IOINES RIVER FLOOD PLAIN INFOR-
ON DES MOINES, IOWA.
of Engineers, Rock Island, Ill.

Corps of Engineers Flood Plain Report, April
65 p, 36 fig, 23 plate, 9 tab.

ptors: *Floods, *Flood damage, *Iowa,
plains, Regional flood, Flood forecasting,
control.
iers: *Des Moines (Iowa), *Polk County
, Standard project flood, Intermediate re-
flood.

Flooding along the Des Moines River Flood Plain starting from Center Street dam in the city of Des Moines to the downstream side of the Saylorville Dam in Polk County, Iowa is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The greatest recorded flood flow on the Des Moines River within the study reach occurred on June 24, 1954. The discharge was 60,200 cubic feet per second with a peak stage of 30.16 feet at the Second Avenue gage. The corresponding discharge and stage at the County Road 'W' bridge gage were 60,000 cubic feet per second and 24.50 feet, respectively. (Woodard-USGS)
W71-08939

A SYSTEM FOR DETECTING FLUORESCENT TRACERS IN STREAMFLOW,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 07A.
W71-08940

SURFACE WATER SYSTEM - OPERATIONAL HANDBOOK,
Wyoming Univ, Laramie.
For primary bibliographic entry see Field 07C.
W71-08941

2F. Groundwater

SWASH ZONE PROCESSES: AN EXAMINATION OF WATER MOTION AND THE RELATIONS BETWEEN WATER MOTION AND FORESHORE RESPONSE ON SOME MIXED SAND AND SHINGLE BEACHES, KAIKOURA, NEW ZEALAND,
For primary bibliographic entry see Field 02J.
W71-08325

WATER RESOURCES IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
Geological Survey, Nashville, Tenn.
Charles R. Burchett, and Gerald K. Moore.
Tennessee Division Water Resources, Water Resources Series No 8, 1971. 62 p, 42 fig, 3 tab, 26 ref.

Descriptors: *Tennessee, *Hydrogeology, *Water resources development, *Water supply, *Water yield, Discharge (Water), Groundwater, Aquifer characteristics, Surface water, Domestic water, Aquifers, Fresh water, Hydrologic cycle, Subsurface waters, Water sources, Water storage, Rock properties, Connate water, Data collections, Hydrologic data, Water quality, Joints (Geology), Municipal water.
Identifiers: *Murfreesboro (Tenn), *Rutherford County (Tenn), *Nashville Basin, *Upper Stones River Basin (Tenn), Water availability, Solution cavities.

The upper Stones River basin, an area of 571 square miles in central Tennessee, is characterized by the soil cover overlying limestone formations. The formations generally are poor of water-storing (yielding) capability, resulting in low to moderate groundwater yield and highly variable streamflow. Groundwater is available in most of the basin, primarily from cracks and solution cavities in the limestone bedrock. Springs occur throughout the basin but are more numerous in the eastern part where they are located near or at the base of the steep ridges that form the Highland Rim. The minimum yield of springs within the basin ranges from less than 1 gallon per minute to more than 800. The chemical quality of groundwater varies from place to place in the basin, and 80 percent of the wells yield water that is very hard (more than 180 milligrams per liter). Murfreesboro's water supply is furnished from a spring and from East Fork Stones River whereas Woodbury's water supply is furnished entirely from a spring. Four rural water utility districts buy water from these municipalities and pipe the water to the rural residents both inside and outside the upper Stones River basin. The potential water supplies of the municipalities of Woodbury, Readyvile, Murfreesboro, Lascassas, Walter Hill, Milton, and Christiana are described as to water availability and yield. (Glasby-USGS)
W71-08330

WATER RESOURCES OF WARD COUNTY, TEXAS,
Geological Survey, Austin, Tex.
D. E. White.
Texas Water Development Board Report 125, Feb 1971. 219 p, 31 fig, 9 tab, 48 ref.

Descriptors: *Hydrogeology, *Water resources development, *Aquifers, *Texas, *Groundwater, Water quality, Water yield, Recharge, Infiltration, Seepage, Return flow, Brines, Salinity, Evapotranspiration, Data collections, Hydrologic data, Withdrawal, Water wells, Water utilization, Consumptive use, Water balance.
Identifiers: *Ward County (Tex).

Ward County is an area of 827 square miles in the Pecos River Valley of West Texas. The county consists primarily of rolling uplands used largely for ranching. The Pecos River borders the county on the south and west. The flood plain and terraces along the river are extensively cultivated and irrigated. During 1967, total pumpage of groundwater from three aquifers totaled 34,400 acre-feet. Water for irrigation is supplied both by wells and from the Pecos River. In 1967, pumpage for irrigation was 9,200 acre-feet, and diversion of river water was 75,510 acre-feet. More than one-half of the water diverted was lost to seepage from canals. Natural recharge is estimated to be about 12,000 acre-feet per year, and about 45,000 acre-feet was added to this in 1967 by seepage and deep percolation losses. Natural discharge is estimated at 40,000 acre-feet, or about three times the amount of natural recharge. The quality of the groundwater ranges from fresh to brine. Additional development of the Allurosa aquifer is anticipated, with most of the water being obtained from the 10 million acre-feet that is estimated to be in storage. However, a large part of the water in storage is too highly mineralized for drinking purposes and can be used only to irrigate the more salt-tolerant crops. (Knapp-USGS)
W71-08331

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE ARKANSAS RIVER VALLEY, BENT COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W71-08333

CAPILLARY TUBE THEORY AND THE EFFECT OF THE PORE-SIZE DISTRIBUTION INDEX FOR DRAINAGE IN POROUS MEDIA,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Engineering.
Macra D. Alfajardo.
M Sc Thesis No 279, Asian Institute of Technology, 1969. 67 p, 9 fig, 9 ref, 2 append.

Descriptors: *Groundwater movement, *Saturated flow, *Porous media, *Pore pressure, Drainage, Porosity, Flow rates, Theoretical analysis, Model studies, Numerical analysis, Equations, Hydraulic conductivity, Capillary conductivity, Permeability, Water table, Analytical techniques.
Identifiers: *Pore-size distribution.

A theoretical investigation of the one-dimensional drainage of an initially saturated medium by the effect of gravity to a water table was studied. Approx-

imate solutions were developed describing the accumulated volume of flow per unit cross-sectional area to the water table as a function of time and measurable soil properties. The approximate solutions were obtained using an analogy of a capillary tube and the effect of the pore-size distribution index of porous media. The final solutions were given in an integral form which were numerically integrated. The validity of the theoretical equations were verified by comparison with experimental data obtained by previous investigators. (Woodard-USGS)
W71-08340

PORE-SIZE DISTRIBUTION OF A POROUS MEDIUM AND ITS APPLICATION,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Engineering.
Ying-Yeung Ho.
M Sc Thesis No 306, Asian Institute of Technology, 1970. 114 p, 30 fig, 8 tab, 22 ref, 3 append.

Descriptors: *Groundwater movement, *Porous media, *Porosity, *Pore pressure, Saturated flow, Drainage, Flow rates, Theoretical analysis, Model studies, Numerical analysis, Equations, Hydraulic conductivity, Capillary conductivity, Analytical techniques, Permeability.
Identifiers: *Pore-size distribution.

This theoretical investigation considered the characteristics of pore-size distribution of a medium and its applications. An equation relating the effective saturation with capillary pressure was proposed as the pore-size distribution function of the medium. Theoretical equations of hydraulic conductivity for wetting and nonwetting fluids were developed as functions of capillary pressure and saturation using the pore-size distribution proposed in this study. The theoretical equations were then verified by experimental data obtained by previous investigators. The pore-size distribution function was also applied to solve two case studies of drainage problems; one-dimensional vertical drainage of initial saturated media and two-dimensional drainage into open ditches or tile drains. The theoretical solution of the one-dimensional drainage was verified using numerical and experimental results from previous investigators. (Woodard-USGS)
W71-08345

THE SIGNIFICANCE OF THE OGALLALA FORMATION IN TEXAS,
International Center for Arid and Semi-arid Land Studies, Lubbock, Texas.
Frank B. Conselman.
In: The Ogallala Aquifer--a Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 2-4, 1970. 3 p.

Descriptors: *Aquifers, *Hydrogeology, *Texas, Reviews, Water yield, Water storage, Water utilization, Transmissivity, Permeability, Porosity, Withdrawal, Water quality, Groundwater movement, Recharge, Irrigation water, Water resources development.
Identifiers: *Ogallala aquifer (Texas).

The Ogallala aquifer of Texas underlies 35,000 square miles, and has an average saturated reservoir thickness of 140 feet. Porosity averages 30%, and specific yield is 15%. Transmissibility is about 30,000 gallons per day per foot. In 1968 the Texas Ogallala provided 9.8 million acre-feet of water, equal to 73% of all the groundwater withdrawals in Texas. Moreover, water withdrawn as groundwater from the Ogallala was almost twice as much as the total water usage from all surface storage in the state. Irrigation gets most of the present withdrawals; municipal and industrial use gets about 22%, AND A SMALL PERCENTAGE IS USED IN WATER—FLOODING OF OIL FIELDS FOR SECONDARY RECOVERY. These withdrawals far exceed recharge rates. (See also W71-08350 thru W71-08357) (Knapp-USGS)
W71-08349

THE OGALLALA FORMATION--A REVIEW,
Illinois State Geological Survey, Urbana.
John C. Frye.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 5-14, 1970. 10 p, 3 fig, 13 ref.

Descriptors: *Aquifers, *Hydrogeology, *Texas, Stratigraphy, Transmissivity, Permeability, Porosity, Water quality, Structural geology, Groundwater, Water resources development, Topography, Geomorphology.
Identifiers: *Ogallala aquifer (Texas).

The Ogallala formation was deposited during late Miocene and Pliocene time in pre-existing valley systems across the Great Plains by streams flowing eastward to southeastward from sources in the mountains. Late Tertiary or earliest Quatennary warping placed the coalescent alluvial deposits in a position vulnerable to Pleistocene erosion, and as a result they now stand as a plateau between the eroded mountain foreland and the central interior plains. Hydrologic properties of the Ogallala are strongly influenced by the predepositional topography, the aligment of the filled valleys and of the major channel gravels, and by the hydrologic barriers, particularly buried soils in the upper half of the formation. (See also W71-08349) (Knapp-USGS)
W71-08350

GEOLOGY AND GROUNDWATER IN THE OGALLALA FORMATION AND UNDIFFERENTIATED PLEISTOCENE DEPOSITS, SOUTHWESTERN KANSAS,
Geological Survey, Garden City, Kans.
Harold E. McGovern.
In: The Ogallala Aquifer--A Snymposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 15-29, 1970. 15 p, 9 fig, 10 ref.

Descriptors: *Aquifers, *Hydrogeology, *Paleohydrology, *Sedimentation, *Kansas, Strategraphy, Artesian wells, Water yield, Water levels, Water resources development, Withdrawal, Irrigation water, Permeability, Porosity, Transmissivity, Recharge, Groundwater movement.
Identifiers: *Ogallala Aquifer (Kansas).

As a result of subsidence in the underlying Permian red beds, Ogallala deposits in much of southwestern Kansas were buried beneath younger sediments. Early Pleistocene streams carved into the Ogallala, forming a deep southeast-trending valley system. Initial refilling of the basin was by alternating fine- to course-grained stream deposits followed by deposition of thick beds of fine-grained lacustrine sediments. During the late Pleistocene time, rejuvenated streams cut channels into older deposits and refilled the remainder of the basin with alternating fine- to course-grained sediments. The sequence of geomorphic events is reflected in the variety of unconfined and semiconfined conditions that exist within the groundwater reservoir. Wells in the upper materials generally show characteristics of an unconfined aquifer. Wells screened in the lower materials show characteristics of a semiconfined aquifer. Water levels are declining as a result of pumpage from more than 5,000 wells. The annual rate of decline depends upon the density of irrigation development, the intensity of pumpage, and the degree of aquifer confinement. Areas of great saturated thickness and intensive development have shown significant declines in artesian pressure, but well yields remain undiminished. (See also W71-08349) (Knapp-USGS)
W71-08351

THE USE OF WELL LOGGING IN RECHARGE STUDIES OF THE OGALLALA FORMATION,
Geological Survey, Lubbock, Tex.
W. S. Keys, and R. F. Brown.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 31-48, 1970. 18 p, 9 fig, 5 ref.

Descriptors: *Borehole geophysics, *Loggi (Recording), *Texas, *Permeability, *Hydrogeol gy, Subsurface investigations, Aquifers, Artifici recharge, Water spreading, Infiltration, Porosit Soil moisture, Nuclear moisture meters, Radioa tive well logging.
Identifiers: *Well logging, *Ogallala aquifer (Te as).

The Geological Survey initiated a major study artificial recharge at Lubbock, Texas, in fiscal ye 1969. This paper deals with the use of geophysi well-logging in investigations of artificial rechar through water-spreading on the land surface. O of the major research efforts is to develop metho for measuring or estimating the vertical permeab ty of the unsaturated zone so that favorable sites surface spreading can be selected on the basis drilling, logging, and testing. Logging is used guide construction of air-permeability holes may be used to provide porosity and moisture d for the calculations. One of the purposes of logging and sampling is to describe the unsatura part of the Ogallala Formation with sufficient ac racy to permit development of a correlat between air and water permeabilities and ot lithologic parameters. (See also W71-08349) napp-USGS)
W71-08352

LINEAR FEATURES AND GROUNDWAT DISTRIBUTION IN THE QUALLALA FORM TION OF THE SOUTHERN HIGH PLAINS,
Geological Survey, Denver, Colo.
Warren I. Finch, and James C. Wright.
In: The Ogallala Aquifer--A Symposium, T Tech University, Lubbock, International Cente Arid and Semi-Arid Land Studies Special Re No 39, p 49-57, 1970. 9 p, 4 fig, 8 ref.

Descriptors: *Hydrogeology, *Structural geol *Aquifers, *Texas, Fractures (Geology), F (Geology), Water resources development, A cial recharge, Permeability, Infiltration, Recha Groundwater movement.
Identifiers: *Ogallala aquifer (Tex).

The southeast-trending Running Water D White River lineament and the nearly parallel ble Mountain Fork line are based on linear to raphy and associated drainages and on alinem of closely spaced depressions developed on upper flat caliche caprock surface of the Og Formation in eastern New Mexico and West T The approximate restored post-Ogallala surfa the High Plains appears to be faulted along Running Water Draw-White River lineament thick zone of the water-saturated Ogallala north of the Double Mountain Fork line an tends along the Running Water Draw-White lineament. It is suggested that artificial rechar the Ogallala aquifer may be best done along drainages and alinements of depressions. (Se W71-08349) (Knapp-USGS)
W71-08353

DRAINAGE PATTERN ANALYSIS, SOUTH HIGH PLAINS, WEST TEXAS AND EAST NEW MEXICO,
Texas Technological Coll. Lubbock. Dep Geosciences.
C. C. Reeves Jr.
In: The Ogallala Aquifer--A Symposium, Tech University, Lubbock, International Cen Arid and Semi-Arid Land Studies Special R No 39, p 58-71, 1970. 14 p, 4 fig, 2 tab, 40 ref

Descriptors: *Structural geology, *Hydroge *Aquifers, *Texas, Fractures (Geology), (Geology), Water resources development, cial recharge, Permeability, Groundwater ment, Infiltration.
Identifiers: *Ogallala aquifers (Texas).

The regional drainage pattern and the locati large pluvial lake basins on the southern Plains, West Texas and eastern New Mexic controlled by three lineament directions whic

spond to the world's deep-seated regmatic fracre pattern. The strict control of Pleistocene ainage and of the pluvial lake basins, yet the vergance of the drainage established by the ched dune pattern northeast of Lovington, New exico, indicates the most recent movement along e regmatic shears was in post-Pliocene but pre-te Pleistocene time. Examination of the Ogallala tcrops along the 'caprock' caliche escarpments eastern New Mexico and West Texas fails to veal any fracture systems, although polygonal nting locally occurs on outcrops of the lower rt of the Ogallala. The Ogallala section consists inly of incompetent sands, silts, clays and vels which would not be expected to maintain en fractures long after formation. (See also 71-08349) (Knapp-USGS)
71-08354

GITAL SIMULATION OF THE OGALLALA QUIFER IN SHERMAN COUNTY, RTHWESTERN KANSAS,
nsas State Geological Survey, Lawrence; and ological Survey, Lawrence, Kans.
omas J. McClain, and Edward D. Jenkins.
The Ogallala Aquifer--A Symposium, Texas ch University, Lubbock, International Center for d and Semi-Arid Land Studies Special Report 39, p 72-88, 1970. 17 p, 10 fig, 2 tab, 5 ref.

scriptors: *Simulation analysis, *Computer proms, *Water balance, *Aquifers, *Water ources development, Kansas, Recharge, hdrawal, Discharge (Water), Groundwater vement, Transmissivity, Irrigation water, Mupal water, Water sources, Groundwater, Water ls, Water utilization, Hydrologic budget, drogeology.
ntifiers: *Ogallala aquifer (Kansas).

area of 340 square miles in Kansas was selected he purpose of developing a digital model of the llala aquifer. The selected area has 253 irriga, four industrial, and seven municipal wells. hdrawal from 1966 through 1969 was comd for each well from municipal, industrial, and er-company records. Aquifer tests and waterl measurements were made at selected wells to rmine average aquifer coefficients. A digital puter model was used to simulate inflow, out, water levels, recharge, transmissivity, storage fficient, saturated thickness, and yield. After model was tested and found to be generally patible with actual field conditions during 6 through 1969, it was programmed to define effects of future development (1970 through 9). Water-level declines related to time and of pumpage illustrate the results of the simula- (See also W71-08349) (Knapp-USGS)
-08355

MERICAL MODEL OF THE OGALLALA AS ANAGEMENT TOOL,
s Technological Coll. Lubbock. Dept. of Civil neering.
primary bibliographic entry see Field 06A.
-08356

TOPE COMPOSITION OF UNDERGROUND NES AS AN INDICATOR OF THEIR GIN (RUSSIAN: OB IZOTOPNOM SOSTAV ZEMNYKH RASSOLOV KAK AZATELE IKH PROISKHOZHDENIYA),
ut Prirodnogo Gana. Moscow (USSR).
Polivanova.
himiya No 7, p 829-837, July 1970. 5 fig, 1 20 ref.

riptors: *Brines, *Deuterium, *Groundwater, s, Evaporation, Infiltration, Sea water, gn research.
ifiers: *USSR, Isotope compositon, Isotope nge, Mineralization.

on recent attempts to use deuterium as an inor of the origin of underground brines are reviewed. A low content of deuterium usually is considered a direct indicator of the infiltration origin of groundwaters. Facts indicate, however, that brines formed from prolonged evaporation also have a low deuterium content. A low deuterium content can be shown to be associated with a change in the brine composition during evaporation from a sodium brine to a magnesium brine, which results in a sharp change in the structure of the solution. The content of heavy isotopes in evaporation brines is influenced not only by isotope exchange between liquid and atmospheric vapor but also by the concentration of dissolved salts and their composition. It is assumed that the isotope composition of the waters of evaporite basins of various geological epochs differs from that of the waters of the world's oceans and that the waters of the basins may be either deficient or rich in heavy isotopes, depending upon the degree of brine concentration. The deuterium content cannot be considered as an indicator of the origin of underground brines; therefore, there is no justification for assuming an infiltration origin for a brine on the sole basis of a low deuterium content. (Josefson-USGS)
W71-08367

STEADY DRAINAGE OF LAYERED SOILS: I, THEORY,
Iowa State Univ. of Science and Technology, Ames. Water Resources Research Inst.
For primary bibliographic entry see Field 02G.
W71-08520

STEADY DRAINAGE OF LAYERED SOILS: II, NOMOGRAPHS,
Iowa State Univ. of Science and Technology, Ames. Water Resources Research Inst.
For primary bibliographic entry see Field 02G.
W71-08521

SEA-WATER INTRUSION: BOLSA-SUNSET AREA, ORANGE COUNTY,
California Dept. State of Water Resources, Sacramento.
For primary bibliographic entry see Field 05B.
W71-08527

GEOLOGICAL SURVEY RESEARCH 1970, CHAPTER A.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W71-08532

THE PROTECTION OF GROUNDWATER RESOURCES.
For primary bibliographic entry see Field 04B.
W71-08542

WATER FLOWS IN FISSURED ROCK AND THEIR EFFECTS ON THE STABILITY OF ROCK MASSIFS,
Karlsruhe Univ. (West Germany).
For primary bibliographic entry see Field 08E.
W71-08544

THE HYDROGEOLOGICAL INVESTIGATION OF FISSURE-FLOW BY BOREHOLE LOGGING TECHNIQUES,
Institute of Geological Sciences, London (England). Dept. of Hydrogeology.
Tom Keith Tate, Anne Shirley Robertson, and David Alfred Gray.
Quarterly Journal of Engineering Geology, Vol 2, No 3, p 195-215, Feb 16, 1970. 21 p, 4 fig, 5 plate, 5 tab, 13 ref, append.

Descriptors: *Groundwater movement, *Borehole geophysics, *Logging (Recording), *Electrical well logging, *Borehole cameras, Artesian wells, Fissures (Geology), Limestones, Aquifers, Aquifer characteristics, Karst.
Identifiers: *Borehole television.

The instrumentation and techniques developed for the investigation of fissure-flow in consolidated aquifers are described and illustrated by three case histories. The use of closed-circuit underwater television inspection of boreholes is outlined and consideration is given to the implications of flow rates by analysis of the tritium contents of some water samples. Borehole-logging methods were used to identify the strata forming the walls of the well, to locate fissures, and to measure the physical properties of the column of the water in the well. The identification and the location were undertaken with conventional logging equipment as well as with a closed-circuit underwater television camera. (Knapp-USGS)
W71-08547

SOME ASPECTS OF THE TRIASSIC AQUIFER IN EAST DEVON AND WEST SOMERSET,
Sherrell (Frederick) Engineering Geologists, Tavistock (England).
Frederick William Sherrell.
Quarterly Journal of Engineering Geology, Vol 2, No 4, p 255-286, May 27, 1970. 32 p, 15 fig, 9 tab, 14 ref.

Descriptors: *Water resources development, *Hydrogeology, *Aquifer characteristics, *Sandstones, *Limestones, Water wells, Water levels, Safe yield, Conjunctive use, Induced infiltration, Transmissivity.
Identifiers: *England, Devon (England), Somerset (England).

The geology of the Triassic in east Devon and west Somerset, England, is reviewed, and new information relating to aquifer thickness and the changes in particle size is presented. These factors, together with the degree of cementation of the strata, have a great influence on infiltration, storage and yield. Changes in lithology take place in the aquifers with latitude. These changes play a dominant role in groundwater yield. In the uncemented aquifer in east Devon, the yield from a borehole is closely associated with the saturated thickness, but local variations may occur, due to induced recharge from streams or rivers. The risk of saline contamination will prevent development of the aquifer in the coastal area of south-east Devon. In west Somerset, a yield of the order of 5000 gal/hr or less is to be expected. Although adequate infiltration may occur and a high theoretical yield may be indicated, the geological conditions are such that a dense distribution of small diameter boreholes, approximately 8 inches (0.203 m), would be required to bring about the maximum practicable abstraction. (Knapp-USGS)
W71-08548

A CONTRIBUTION TO THE ANALYSIS OF RECOVERY DATA FOR THE DETERMINATION OF THE HYDRAULIC PROPERTIES OF AN AQUIFER,
Geological Survey of Denmark, Copenhagen.
For primary bibliographic entry see Field 04B.
W71-08549

BASIN RECHARGING THE OGALLALA AQUIFER THROUGH PLEISTOCENE SEDIMENTS,
Agricultural Research Service, Bushland, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04B.
W71-08570

COMPARISION OF METHODS FOR DETERMINING THE SPECIFIC YIELD OF THE OGALLALA,
Southwestern Great Plains Research Center, Bushland, Tex.
Ordie R. Jones, and Arland D. Schneider.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 118-130, 1970. 13 p, 6 fig, 2 tab, 9 ref.

Descriptors: *Specific yield, *Aquifers, *Texas, Pumping, Nuclear moisture meters, Cores, Tracers, Groundwater movement, Withdrawl, Storage coefficient, On-site tests, Laboratory tests, Water levels, Recharge, Hydrogeology.
Identifiers: *Ogallala aquifer (Texas).

In order to evaluate and compare the results of different methods of determining specific yield, the specific yield of the Ogallala aquifer at the USDA Southwestern Great Plains Research Center, Bushland, Texas, was determined by (1) pump and recharge tests (2) the neutron method (3) tracer techniques and (4) laboratory analyses of cores. The method selected to analyze pump and recharge test data is important. Generally, Jacob's straight-line method gave smaller values of (S) than did the curve matching methods, although both are solutions of the nonequilibrium formula. The specific yield of the aquifer was also determined with a neutron moisture meter. Nitrate can be used as a tracer for water recharged to the Ogallala. The difference between the specific yields determined by tritium and nitrate was due mainly to difficulty in accounting for the nitrate present in the native groundwater. Specific yield values were determined for over 100 1-foot long 3-inch diameter undisturbed cores from the Ogallala at Bushland. The specific yield of the aquifer at Bushland is greater than 0.20 and is probably 0.22. The average specific yield determined by pump test was 0.15. (See also W71-08349 thru W71-08357) (Knapp-USGS)
W71-08571

WATER TRANSFER AT BEDROCK-ALLUVIUM CONTACTS,
Colorado State Univ., Fort Collins. Dept. of Geology.
James P. Waltz.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 145-153, 1970. 9 p, 5 fig, 6 ref.

Descriptors: *Groundwater movement, *Aquifers, *Colorado, *Groundwater basins, Discharge (Water), Recharge, Water management (Applied), Withdrawl, Simulation analysis, Water levels, Hydrogeology.
Identifiers: *Ogallala aquifer (Colo).

Preliminary investigations indicate that appreciable volumes of water may be passing through the contact between the alluvial aquifers and the supposedly impermeable bedrock in the High Plains, Kiowa-Bijou, and Black Squirrel Designated Basins of Colorado. The principal aquifer in the High Plains of Colorado is the Ogallala Formation of Pliocene age. The underlying bedrock consists mainly of the Cretaceous Pierre Shale Formation. In the northern portion of the area, however, the Ogallala Formation is underlain by the Oligococene White River Group. Groundwater is transferred from the Ogallala aquifer through the nearly horizontal channel deposits of the White River Group northwestward into the alluvium of the South Platte River. Quaternary and recent stream deposits are the principal aquifer in the Kiowa-Bijou basin. Beneath the alluvial aquifers lie the Cretaceous sediments of the Pierre Formation, Fox Hills Formation, and the Larmie Formation. Piezometric levels exceeded water table levels in several areas; hydraulic conditions cause groundwater to move from the Fox Hills aquifer into the alluvium in these localities. Preliminary results from a computer simulation of groundwater flow within a portion of the Black Squirrel Creek Basin show that approximately 4,000 acre feet of groundwater passes from the alluvial aquifer into the Fox Hills Sandstone each year. (See also W71-08349 thru W71-08357) (Knapp-USGS)
W71-08572

METHOD FOR ESTIMATING AVERAGE COEFFICIENT OF PERMEABILITY USING HYDROGEOLOGIC FIELD DATA,
Geological Survey, Cheyenne, Wyo.
Richard Howard Pearl.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 131-144, 1970. 14 p, 2 fig, 5 tab, 6 ref.

Descriptors: *Permeability, *Aquifers, *Kansas, Alluvium, Particle size, Groundwater movement, Laboratory tests, Anistropy, Stratigraphy, Regression analysis, Statistical methods, Correlation analysis, Hydrogeology.
Identifiers: *Ogallala aquifer (Kansas).

The relations between average permeability and particle-size distribution in the Ogallala aquifer of Kansas were derived by multiple regression. The only size fractions significantly correlated with permeability were found to be fine and very fine gravel. This result is in conflict with most laboratory studies wherein the permeability was found to be highly correlated with the smaller-size fractions. Most laboratory measurements are made on samples taken perpendicular to the bedding planes, but average permabilities of interest in the field relate to flow parallel to the bedding planes. Therefore, correlations between permeability to horizontal flow and the larger size fractions may be of greatest significance for field use. (See also W71-08349 thru W71-08357) (Knapp-USGS)
W71-08573

PROBLEMS OF ARTIFICALLY RECHARGING THE OGALLALA FORMATION IN COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-08574

A MATHEMATICAL MODEL FOR DETERMINING AREAL DISTRIBUTION OF NATURAL RECHARGE IN THE NORTHERN HIGH PLAINS OF COLORADO,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
Donald L. Reddell.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 165-181, 1970. 17 p, 8 fig, 3 tab, 4 ref.

Descriptors: *Groundwater recharge, *Aquifers, *Colorado, *Mathematical models, Simulation analysis, Numerical analysis, Groundwater movement, Infiltration, Permeability, Water yield, Discharge (Water), Hydrogeology.
Identifiers: *Ogallala aquifer (Colo).

The average annual rate and areal variation of natural recharge to the Ogallala Formation in the Northern High Plains of Colorado were studied using a mathematical model checked by review data collections. The distribution of recharge appears to be largely a function of the surface conditions as reflected by the geology, soils and topography of the area. For instance, net recharge rates in excess of two inches per year are primarily confined to the sandhill portion of the study area. These sandhills lie mostly above the water table, have a permeability, and a poor surface drainage system. The total volume of net recharge to the Ogallala Formation in Northern Colorado was computed to be 405,000 acre-feet per year or an average of about about 0.82 inch per year over the entire study area. This compared favorably with a previous estimate of 0.85 inch per year. The finite difference method of calculating net recharge is limited in its quantitative results by the quality of the input data. The best check available of the applicability of the method to field conditions is shown by the close correlation between the net discharge calculation from the finite difference method and the amount of discharge as estimated from stream flow measurements on the north and south forks of the Republican River and the Arikaree River. (See also W71-08349 thru W71-08357) (Knapp-USGS)
W71-08575

GROUNDWATERS OF MAGNESITE KARST IN CZECHOSLOVAKIA (GERMAN: UNTERIRDISCHE WASSER DES MAGNESITKARSTES IN DER CSSR),
Stanislav Klir.
English abstract. Steirische Beitrage zur Hydrogeologie, No 20, Graz, p 5-22, 1968. 18 p, 5 fig, 5 ref.

Descriptors: *Karst, *Mine water, *Hydrogeology, Erosion caves, Clays, Mine drainage, Iron, Leaching, Solubility, Groundwater movement.
Identifiers: *Czechoslovakia, *Magnesite.

The karstification of the magnesite deposits in the carboniferous strata of the Slovacian Gemerides is directly related to the direction of large faults. The intensity of the karstification is proportional to the intensity of the faults. The fissures and caves of the magnesite karst are usually filled with ochre developed through precipitation of iron from underground water as well as through the leaching of the carbonate rocks. Liberal flow of underground water causes the discharge of ochre from the karst caves into nearby mine shafts. Reduction of the waterflow causes consolidation of the ochre. This consolidation is accompanied by swelling of the ochre, which endangers mining work in parts of the deposit in which the swelling causes accumulation of water in the karst caves. (Knapp-USGS)
W71-08576

WATER MANAGEMENT OF THE VOGELSBERG BASALT PALEOZOIC VOLCANO IN HESSEN (GERMAN: UBER DEN WASSERHAUSHALT DES BASALTISCHEN PALAOVULKANS VOGELSBERG IN HESSEN),
Oberhessische Versorgungsbetriebe, Hungen (West Germany). Geologische Forschungsstelle.
E. Schenk.
English abstract. Steirische Beitrage zur Hydrogeologie, No 20, Graz, p 23-50, 1968. 28 p, 11 fig, 20 ref.

Descriptors: *Hydrogeology, *Basalts, *Base flow, Water balance, Water levels, Water table, Surface-groundwater relationships, Surveys, Groundwater movement, Infiltration.
Identifiers: Hessen (GRF).

In the basalt area of the Vogelsberg, Hessen, GF groundwater runoff into the river Nidda was determined. It is relatively high for the total precipitation area (9 liters per sec per sq km). The infiltration is 15 to nearly 60% of precipitation and depends on the groundwater level. (Knapp-USGS)
W71-08577

WASTE OF ARTESIAN WATERS IN EA STYRIA (GERMAN: RAUBBAU AN ARTESISCHEM WASSER IN DER OSTSTEIERMARK),
Technische Hochschule, Graz (Austria). Institut fuer Mineralogie und Technische Geologie.
For primary bibliographic entry see Field 04B.
W71-08579

OBSERVATIONS OF THE EFFECT OF EXTREME HIGH WATER IN 1965 AND 1966 ON THE GROUNDWATER BODY OF THE LIENZ BASIN-EAST TIROL (GERMAN: BEOBACHTUNGEN UBER DIE AUSWIRKUNG DER EXTREMEN HOCHWASSER 1965 UND 1966 AUF DEN GRUNDWASSERKORPER IM BECKEN VON LIENZ (OSTTIROL),
For primary bibliographic entry see Field 02A.
W71-08580

GROUNDWATER IN THE LEIBNITZER FELD, STYRIA (GERMAN: DAS GRUNDWASSER IM LEIBNITZER FELD, STEIERMARK),
Technische Hochschule, Graz (Austria). Institut fuer Mineralogie und Technische Geologie.
J. Zotl.
English abstract. Steirische Beitrage zur Hydrogeologie, no 20, Graz, p 99-151, 1969. 25 fig, 1 tab, 18 ref.

Descriptors: *Hydrogeology, *Surface-groundwater relationships, Groundwater recharge, Water levels, Reservoir leakage, Alluvium, Alluvial channels, Terraces (Geological), Water level fluctuations, Water balance, Hydrologic budget.
Identifiers: *Leibnitzer Feld (Austria), *Austria.

The groundwater balance in the quaternary gravel body of the Leibnitz Feld, Austria, was studied by investigations conducted over a number of years. East of the Mur River most of the Leibnitz Field is occupied by the holocene river-meadow landscape; west of the Mur, Pleistocene glacial terraces are preserved. Seasonal water level fluctuations result from differences of the geological conditions, the recharge area and the influence of the river. The thickness of the groundwater body decreases from over 8 m in the extreme northeast of the Mur to 3--4 m in the south of the Leibnitz Field. Damming of the Mur in the course of construction of the power station near Gralla had effects on the groundwater body chiefly in the area on the right bank. There was an immediate and marked but ephemeral rise of the groundwater level; from mid-1965 onward, the natural tightness of the river-bed of the Mur soon stabilized conditions again. Water-table isohypses and serial tests of groundwater hardness justify the assumption that the water of the Mur has penetrated into the groundwater body no farther than 500 m westward. (Knapp-USGS)
W71-08581

GROUNDWATER IRRIGATION IN THE TIRASPOL' DISTRICT OF MOLDAVIA (RUSSIAN: OROSHENIYE PODZEMNYMI VODAMI TIRASPOL'SKOM RAYONE MOLDAVII),
A. I. Voronov.
Gidrotekhnika i Melioratsiya, No 1, p 53-58, Jan 1971. 6 p, 3 fig, 3 tab.

Descriptors: *Irrigation systems, *Irrigation wells, Artesian wells, *Reservoir storage, *Groundwater, Drawdown, Specific capacity, Aquifers, Water storage, Water analysis, Pumping plants, Vegetable crops, Rotations.
Identifiers: *USSR, Moldavia, Irrigation agriculture.

Irrigation agriculture in the Tiraspol' Rayon of Moldavia can be developed through the use of groundwater from artesian wells. The static level of groundwater of the region is at a depth of 40-90 m from the soil surface. Depth of water wells is between 90 and 140 m. Specific capacity of wells in the northeastern part of the rayon is 2-5 cu m/hr and in the southeastern part 10 cu m/hr or more. Analysis of water shows that total solids content in most drilled wells does not exceed 1 g/liter and the total hardness of water varies between 4 and 14 mg/liter. To effectively use groundwaters for irrigation it is advisable to store water from artesian wells in reservoirs. Subsurface irrigation systems constructed for the utilization of groundwater are simple in design, easy to operate, and fully pay for themselves in the first few years of operation. (Sefson-USGS)
W71-08582

SEEPAGE FACE EFFECTS IN UNSTEADY GROUND-WATER FLOW,
Wisconsin Univ., Madison. Water Resources Center.
Willard A. Murray.
Available from the National Technical Information Service as PB-199 831, $3.00 in paper copy, $0.95 in microfiche. Technical Report, OWRR B-021-WIS-1, Water Resources Center, The University of Wisconsin-Madison, 1970, 143 p, 21 fig, 10 tab, 56 ref, OWRR Project B-021-WIS (1).

Descriptors: *Seepage, *Free surface, *Dimensional analysis, *Aquifer, *Ditches, *Streams, Flow, Water table, Drawdown.
Identifiers: *Saturated region, *Fourier analysis, *Flow face.

The study deals with the effect of the seepage face on the location of the free surface in a two-dimensional unconfined aquifer adjacent to a ditch or stream. The analysis is restricted to considering flow only in the saturated region below the water table; unsaturated flow effects are neglected. Theoretical solutions were obtained for steady state conditions and for the transient case of instantaneous drawdown by using potential theory and standard Fourier methods. The steady state solution is a corrected form of that presented by Kirkham (1964), which was found to contain a flaw. The transient solution involves a simple extension of the steady state solution and reduces to the latter for large time. Both solutions are presented in infinite series form. For the steady state, theoretical results indicate that the simple Dupuit parabola will give entirely satisfactory predictions of free surface locations for moderate drawdowns. For the transient case, the derived solutions indicate that the seepage face length decays exponentially. Furthermore, the transient solution including the effect of the seepage face shows a marked difference from the simplified potential solution in which the seepage face effect is neglected, particularly for small times and for locations near the outflow face. Experiments were conducted using a Hele-Shaw viscous flow model to verify the theoretical predictions.
W71-08660

THE TEXAS WATER DEVELOPMENT BOARD COOPERATIVE STUDIES OF THE OGALLALA UNDERGROUND RESERVOIR,
Texas Water Development Board, Austin. Groundwater Div.
Gunnar Brune.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 227-242, 1970. 16 p, 9 fig, 13 ref.

Descriptors: *Aquifers, *Texas, *Groundwater recharge, *Surveys, Injection wells, Computer programs, Mapping, Subsurface investigations, Water storage, Stratigraphy, Hydrogeology.
Identifiers: *Ogallala Aquifer (Texas).

The Ogallala underground reservoir, underlying the High Plains, furnished 73% of the groundwater and 53% of the total amount of water used in Texas in 1968. The Ogallala reservoir represents approximately 51% of the total underground water storage capacity available in the State, including dewatered, fresh, and slightly saline reservoirs. It has been estimated that 134 million acre-feet of dry or unsaturated underground stroage capacity is available in the South High Plains alone. The remaining groundwater in the Ogallala reservoir has declined to very low levels in some areas. The average acreage irrigated per well has declined from 140 acres in 1950 to 84 in 1969. The Texas Water Development Board is concerned about these matters, and has undertaken two cooperative studies involving the Ogallala reservoir. The first study is in cooperation with the High Plains Research Foundation of Halfway, Texas. Using recharge and observation wells, the effects on the aquifer of using runoff water in recharge wells are determined. The second study is in cooperation with the U.S. Geological Survey. This study contemplates the possible use of the Ogallala reservoir for underground storage and transmission of imported or local surface water. (See also W71-08349 thru W71-08357 and W71-08570 thru W71-08575) (Knapp-USGS)
W71-08895

APPLICATION OF SURFACE PRESSURE TO ASSIST WATER RECHARGE INTO THE OGALLALA FORMATION,
Texas Tech Univ., Lubbock. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 04B.
W71-08896

MOVEMENT AND RECOVERY OF HERBICIDES IN THE OGALLALA AQUIFER,
Agricultural Research Service, Bushland, Tex. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05B.
W71-08898

GROUNDWATER CONDITIONS IN THE HARQUAHALA PLAINS, MARICOPA AND YUMA COUNTIES, ARIZONA,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 04B.
W71-08900

SELECTED GROUNDWATER DATA IN THE EUGENE-SPRINGFIELD AREA, SOUTHERN WILLAMETTE VALLEY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 07C.
W71-08921

HYDROLOGIC DATA: 1968, VOLUME 4, SAN JOAQUIN VALLEY.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 07C.
W71-08927

WATER RESOURCES OF THE BIG CREEK DRAINAGE BASIN,
Ontario Water Resources Commission, Torento (Ontario). Div. of Water Resources.
For primary bibliographic entry see Field 02E.
W71-08935

GROUND WATER BASIC DATA, HETTINGER AND STARK COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
Henry Trapp, Jr.
North Dakota Water Commission County Ground Water Studies 16, Part 2, 1971. 455 p, 2 fig, 1 plate, 7 tab, 19 ref.

Descriptors: *Groundwater, *Water resources development, *Hydrologic data, *Aquifer characteristics, *North Dakota, Water wells, Data collections, Hydrogeology, Aquifers, Water yield, Water levels, Water quality, Chemical analyses, Water utilization, Water temperature, Water sources, Water table, Observation wells, Geology, Springs, Particle size.
Identifiers: *Groundwater resources, *Hettinger County (N. D.), Stark County (N. D.).

Hydrologic investigations were made in Hettinger and Stark Counties, N. Dak. to determine the quantity and quality of groundwater available for municipal, domestic, livestock, industrial, and irrigation uses. The information was collected between 1966 and 1969, and consists of the following: (1) Data on 3,060 wells and test holes; (2) data on 91 springs; (3) water-level measurements in 61 observation wells; (4) logs of 544 test holes and wells; (5) chemical analyses of 261 water samples; (6) color values of 331 water samples; and (7) 28 particle-size distribution curves. The data are presented in tables and maps. (Wood-USGS)
W71-08938

2G. Water in Soils

WATER REGIME OF MOUNTAIN CHERNOZEMS OF THE KARACHAYEVO-CHERKESSKAYA AUTONOMOUS REGION (RUSSIAN: VODNYY REZHIM GORNYKH CHERNOZEMOV KARACHAYEVO-CHERKESII),
V. A. Baranovskaya.
Meteorologiya i Gidrologiya, No 11, p 88-92, Nov 1970. 2 fig, 2 tab, 5 ref.

Descriptors: *Chernozems, *Soil moisture, *Water storage, *Discharge (Water), Moisture deficit,

Precipitation (Atmospheric), Wilting point, Leaching, Agronomic crops, Climatic data, Soils, Seasonal, Transpiration, Evaporation.
Identifiers: *USSR, Mountain Chernozems, Water regime, Moisture capacity, Chronoisopleths.

Mountain Chernozems of the Karachayevo-Cherkesskaya Autonomous Region are formed at a height of 700-1,600 m above sea level under optimal moisture conditions. A station was set up in the region of the Zelenchukskiy Strain-Testing Plot to study the water regime of a typical mountain Chernozem. For two years of observations the moisture deficit averaged about 130 mm in a 0-300 cm soil layer. Fall and winter precipitation averaged 180 mm and was sufficient to wet the entire 3-m layer to minimum moisture capacity. Discharge of water from spring storage of productive moisture in the 3-m layer of soil during the growing season averaged about 130 mm, with a maximum discharge of 180 mm observed in 1968. Total water discharge during the growing season ranged from 600 to 800 mm. Water discharge from the upper 50-cm layer of soil was 3-4% of the total discharge while that from the 3-m layer was 15-30%. It is concluded from cyclic variations in climate that the water regime of mountain Chernozems is of a periodic leaching type with a predominance of leaching phases. (Josefson-USGS)
W71-08369

FIELD STUDIES OF THE INFILTRATION CAPACITY OF SOILS (RUSSIAN: O POLEVYKH ISSLEDOVANIYAKH VPITYVAYUSHCHEY SPOSOBNOSTI POCHVOGRUNTOV),
For primary bibliographic entry see Field 04A.
W71-08384

BRAK, A THREAT TO OUR IRRIGATION SCHEMES,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Soil Science.
For primary bibliographic entry see Field 03C.
W71-08464

PHASE COMPOSITION OF PORE WATER IN COLD ROCKS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Malcolm Mellor.
Available from the National Technical Information Service as AD-719236, $3.00 in paper copy, $0.95 in microfiche. CRREL Research Report 292, Dec 1970. 59 p.

Descriptors: *Rock mechanics, *Freezing, *Temperature, *Thermal properties, Thermal expansion, Ice, Soils, Polar regions, Compressability, Cold weather construction, Mechanical properties.
Identifiers: Thermal analysis, Strain mechanics, *Pore water, *Interstitial water.

The phase composition of pore water in three types of rock subjected to temperature below 0C was explored by a variety of techniques. Freezing point depression was measured as a function of water content by differential thermal analysis, the results yielding relationships between unfrozen water content and temperature. In an effort to avoid the practical difficulties involved in differential thermal analysis, attempts were made to determine freezing characteristics indirectly by air penetration and mercury penetration techniques applied at ordinary room temperatures. Electrical conductivity measurements were made as a function of temperature down to -195C in an attempt to obtain information on characteristics of interfacial water films at low temperatures. Thermal strain was measured as a function of temperature in order to detect direct mechanical effects associated with phase changes, chiefly strain discontinuities brought about by volume changes in the pore water during rapid freezing and thawing. Finally, isothermal compressibility measurements, with pressures up to 27 kb, were made at -10C so as to determine whether the rock underwent step changes in volumetric strain at pressures corresponding to those of the phase boundaries for ice polymorphs.
W71-08504

STEADY DRAINAGE OF LAYERED SOILS: I, THEORY,
Iowa State Univ. of Science and Technology, Ames. Water Resources Research Inst.
Sadik Toksoz, and Don Kirkham.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 97, No IR-1, Paper 7985, p 1-18, Mar 1971. 18 p, 4 fig, 5 ref, append. OWRR Project B-013 - IA (8).

Descriptors: *Soil water movement, *Subsurface drainage, *Groundwater, *Steady flow, *Agricultural engineering, Flow nets, Seepage, Soils, Soil water, Theoretical analysis, Mathematical studies, Water table.
Identifiers: *Underground drains, Layered soils.

The stream and potential functions for the steady drainage of two-layered and three-layered soils were derived. Two sets of flow nets are given for each case. From the derivations for the two-layered and three-layered soils, steady drainage problems for soils with more than three layers may be solved. (See also W71-08521) (Woodard-USGS)
W71-08520

STEADY DRAINAGE OF LAYERED SOILS: II, NOMOGRAPHS,
Iowa State Univ. of Science and Technology, Ames. Water Resources Research Inst.
Sadik Toksoz, and Don Kirkham.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 97, No IR-1, Paper 7986, p 19-37, Mar 1971. 19 p, 17 fig, 2 tab, 9 ref, append. OWRR Project B-013-IA (9).

Descriptors: *Soil water movement, *Subsurface drainage, *Groundwater, *Steady flow, Agricultural engineering, Flow nets, Seepage, Soils, Soil water, Water table, Mathematical studies, Equations.
Identifiers: *Underground drains, Layered soils, Nomographs.

The drain spacing equations for the two-layered and three-layered soils are given. A set of 16 figures containing 29 nomographs may be used for easy calculation of drain spacings in two-layered soils. Drain spacings calculated by using Dagan's equation for the two-layered soils agree with the spacings calculated from the nomographs. (See also W71-08520) (Woodard-USGS)
W71-08521

POSSIBLE IMPROVEMENT OF ACID SULPHATE SOILS IN COASTAL AREAS OF ASIA BY MEANS OF SEA WATER LEACHING.
Economic Commission for Asia and the Far East, New York.
For primary bibliographic entry see Field 03C.
W71-08545

POROSITY AND PORE-SIZE DISTRIBUTION OF SOIL AGGREGATES,
Minnesota Univ., Minneapolis. Dept. of Soil Sciences.
Shen-maw Lin.
Available from the National Technical Information Service as PB-199 836, $3.00 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center, Bulletin 29, 1971. 32 p, 6 fig, 8 tab, 43 ref. OWRR Project A-006-Minn (3).

Descriptors: *Porosity, *Soil types, *Pores, Aggregate, Minnesota, Cultivated lands, Miscroscopic, Bulk density, Voids, Sand, Clay, Silt, Loess, Glacial drift.
Identifiers: *Pore-size distribution, *Glassbead displacement, *Hg-porosimetry, Intraaggregate, Interaggregate, Thin sectioning.

Differences in aggregate porosity due to soil type, aggregate size and cultivation condition were investigated using samples from 6 Minnesota soils. Porosity characteristics were determined by the glassbead displacement and thin section methods and with Hg-porosimeter measurements. Aggregate porosity was higher in soils developed on loess and lower in those on till. Porosities ranged from 0.253 to 0.497. Aggregate porosity of virgin soil was higher than that of cultivated soil. Specific pore volume of pores of diameters 0.012 to 17 microns ranged from 0.124 to 0.272 cc/g. Over 90% of the specific pore volume was contributed by pores of diameter greater than 0.2 microns. The proportion of intraaggregate porosity to the total porosity was found to be about 0.30 for cultivated soils and 0.30 to 0.40 for virgin soils. (Walton-Minnesota)
W71-08663

AGING EFFECTS ON SWELL POTENTIAL OF COMPACTED CLAY,
Technion - Israel Inst. of Tech., Haifa (Israel). Dept. of Civil Engineering.
Gabriel Kassiff, and Raphael Baker.
ASCE Proceedings, Journal of the Soil Mechanics and Foundations Division, Vol 97, No SM3, Paper 7951, p 529-540, Mar 1971. 12 p, 7 fig, 21 ref, append.

Descriptors: *Soil mechanics, *Clays, *Compaction, *Soil water, *Aging (Physical), Pressure, Soil structure, Soil water movement, Entropy.
Identifiers: *Compacted clay, Inundation, Swelling pressure.

The swelling potential of compacted clay, which develops upon inundation, is defined in terms of the parameters affected by aging. These parameters include swell pressure, volume change and suction. Because in nature the clay is exposed to water some time after compaction, the aging effects on the swelling potential are rather important. Compacted clay samples were aged for up to 90 days and then tested for swelling pressure and free swell using triaxial technique. It was found that the swell pressure, particularly at high initial densities, tends to increase with aging and then gradually decrease to the initial value of zero aging. The amount of swell (under practically zero load) was not markedly affected by aging. The peak values of the swelling potential amounted to two to three times the initial value, and were found to be dependent on the initial placement conditions of the clay. The results are explained by energy concepts, as well as by concepts mainly used in soil science such as thixotropy and entropy of clay-water systems. (Woodard-USGS)
W71-08904

THE DEGRADATION OF LIAS CLAY SLOPES IN AN AREA OF THE EAST MIDLANDS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02J.
W71-08929

2H. Lakes

INFRARED EXPLORATION FOR SHORELINE SPRINGS AT MONO LAKE, CALIFORNIA: TEST SITE,
Colorado School of Mines, Golden. Dept. of Geology.
For primary bibliographic entry see Field 07B.
W71-08359

ISOTOPE COMPOSITION OF URANIUM (U-234, U-238) IN WATERS AND BOTTOM SEDIMENTS OF LAKE BALKHASH, AND AGE OF THE LAKE (RUSSIAN: IZOTOPNYY SOSTAV URANA (U-234, U-238) V VODAKH I DONNYKH OSADKAKH OZ. BALKHASH I ЕГО

OLZHITEL'NOST' SUSHCHESTVOVANIYA ODOYEMA),
kademiya Nauk Kirghiz SSR, Frunze. Inst. of hysics and Mathematics.
I. Chalov, N. A. Svetlichnaya, and T. V. Tuzova.
eokhimiya, No 7, p 848-854, July 1970. 6 tab, 25 f.

escriptors: *Uranium radioisotopes, *Radioac-ve dating, *Bottom sediments, *Lakes, Stable otooes, Rivers, Surface waters, Deep water, ributaries.
entifiers: *USSR, Lake Balkhash, Isotope com-sition.

e age of Lake Balkhash was determined by non-uilibrium uranium isotope ratios from a study of 234 and U-238 in bottom sediments and waters the lake basin. Water samples were taken from e estuaries of all five rivers flowing into the lake d at 30 points along the lake. The results of the dy differed significantly from figures obtained using salt accumulations in calculating the age water bodies. The isotope composition of urani-in the river waters has remained stable for ousands of years. The non-equilibrium uranium tope ratio method gives the absolute age of Lake lkhash as 37 (plus or minus 7) thousand years, ich agrees with a number of geological studies. sefson-USGS)
71-08368

KE VOLTA--A PROGRESS REPORT,
kerere Univ. Coll., Kampala (Uganda).
mislav Petr.
w Scientist and Science Journal, Vol 49, No 6, p 178-180, Jan 28, 1971. 2 fig.

scriptors: *Lakes, *Fish harvest, *Food webs, oductivity, Savannas, Trees, Hypolimnion, pical regions, Biomass, Vegetation effects.
ntifiers: *Lake Volta, *Ghana, *Metalimnion.

e Volta in Ghana has extended over former est and savanna-woodland habitats through 2 natic zones. The amount of organic matter sub-rged by the lake is enormous since no prior aring of vegetation occurred. In the first months the lake, large fish mortality and low oxygen els gave rise to many fears which were fortunate-njustified. When the dry harmattan winds reach area from the Sahara the lake is rigidly tified but in most areas the metalimnion is fairly p. Although some species of fish have disap-red from the lake, others have thrived and ched enormous population levels, creating a ductive fishery. A simple food web was con-cted for the more important species of the lake. ch of the high biomass is attributable to the sub-ged wood which directly and indirectly pro-s food for the fish. No one knows what will hap-to lake productivity when the wood decays, eby posing questions on appropriate long term eries programs. (Casey-Arizona)
1-08471

RMATION OF SULFUR-BEARING MUDS IN ENT CRATER LAKES, (RUSSIAN: OVIYA OBRAZOVANIYA SERONOSYNKH V V SOVREMENNYKH KRATERNYKH ERAKH),
udarstvennyi Nauchno-Issledovatelskii Institut okhimicheskogo Syrya, Lyubertsii (USSR); Akademiya Nauk SSR, Moscow. Institut Geok-i i Analitcheskoi Khimii.
u. Lein, V. A. Grinenko, and M. V. Ivanov.
khimiya, No 8 p 988-997, Aug 1970. 10 p, 6 tab, 16 ref.

riptors: *Sedimentation rates, *Mud-water in-ces, *Sulfur, *Mud, *Geochemistry, Sedi-t-water interfaces, Sulfates, Sulfur compounds, des, Craters, Lakes, Acidic water, Water istry, Clay minerals, Kaolinite, Hydrogen ion entration, Diagenesis, Mineralogy.
tifiers: *USSR, Kuril Islands, Crater lakes, Fu-oles, Chemosedimentation, Halloysite.

The geological and physico-chemical conditions of formation and mineral composition of native sulfur in mud sediments in crater lakes of the Kuril Islands are examined. The character of sediment accumulation in the lakes is determined by interaction of three basic factors: intense uptake of sulfur gases from bottom fumaroles, chemical aggressiveness of ultra-acidic waters, and washing away of clastic and pyroclastic material. The leading process in the formation of sulfur muds in acid crater lakes is chemical precipitation, by which fine-layered sediments of native sulfur (25-55%), opal, alunite and clay minerals are formed. Clay minerals are not formed in the lakes when water pH is less than 1.5; halloysite is formed when pH is 1.5-2.25 and kaolinite is formed when pH is greater than 2.25. Ferric sulfides are formed either at the mud-water boundary when pH is greater than 3 and Eh is less than plus 0.02 volts or in sediment furing diagenesis of muds. The sulfur accumulation rate in crater lakes is hundreds of times greater than ordinary sedimentation. In Lake Goryachcye, for example, average sulfur accumulation is about 48 kg/cu m a year. (Josefson-USGS)
W71-08538

NUTRIENT LIMITING FACTORS IN AN OLIGOTROPHIC SOUTH CAROLINA POND,
Savannah River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 05C.
W71-08543

2I. Water in Plants

PLANT TEMPERATURES AND HEAT FLUX IN A SONORAN DESERT ECOSYSTEM,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
Joan G. Gibbs, and D. T. Patten.
Oecologia, Vol 5, No 3, p 165-184, 1970. 13 fig, 26 ref.

Descriptors: *Arid lands, *Xerophytes, *Energy budget, *Heat balance, *Environmental effects, Ecosystems, Physiological ecology, Solar radiation, Temperature, Plant morphology, Arizona, Shrubs, Soil temperature, Conduction, Convection, Boundary layers, Humidity, Transpiration, Evaporation, Cooling, Condensation, Dew, Seasonal, Cacti, Deserts, Leaves.
Identifiers: *Sonoran Desert, *Vapor pressure deficit, *Adaptations, *Creosotebush, *Temperature profiles.

Thermocouple temperature measurements were made in spring and summer in 6 Sonoran Desert plant species: Opuntia engelmannii, O. bigelovii, O. acanthocarpa and Echinocereus engelmannii, which are cacti, and Larrea tridentata and Franseria deltoidea, which are shrubs. Daily temperature profiles were constructed and used to compare differing seasonal responses of the various species to desert heat load. Cacti absorbed and stored heat and their internal temperatures often rose well above air temperature. Their various high dissipation mechanisms include critical pad angles with the sun, spine reflectivity, convection, temperature-dependent reradiation and heat dissipation from apical stem to basal stem. The relative importance of each of these mechanisms differ between species. The shrub leaf temperatures were always close to air temperature. Their low surface area/volume ratios ensure the importance of convection as a cooling factor. (Casey-Arizona)
W71-08443

CONTENT OF ADENOSINE PHOSPHATE COMPOUNDS IN PEA ROOTS GROWN IN SALINE MEDIA,
Hebrew Univ., Jerusalem, (Israel). Dept. of Botany.
For primary bibliographic entry see Field 03C.
W71-08447

CYTOKININ ACTIVITY IN WATER-STRESSED SHOOTS,
Negev Inst. for Arid Zone Research, Beersheba (Israel). Div. of Life Sciences.
Chanan Itai, and Yoash Vaadia.
Supported by the USDA under contract FG-IS-32.
Plant Physiology, Vol 47, No 1, p 87-90, Jan 1971. 1 fig, 4 tab, 20 ref.

Descriptors: *Moisture stress, *Leaves, *Plant growth substances, Laboratory tests, Humidity, Radiochemical analysis, Plant physiology.
Identifiers: *Cytokinins, *Water potential.

Although plants are usually experimentally water-stressed by limited water availability to the root, they may also be stressed by increasing transpiration demands. Six-8 week old Nicotiana rustica plants were exposed for 30 minutes to an airstream. Subsequent tests showed that leaf cytokinin activity had been reduced as much as it decreased when roots were subjected to water stress. C-14-leucine uptake was also reduced in the stressed leaves and this reduction was not reversible by kinetin treatment. Cytokinin activity approached control levels after several hours in a humid chamber. Labelled kinetin distribution differed in stressed and non-stressed leaves. While changes in water potential transmitted to the roots may affect cytokinin synthesis, lowered levels in stressed detached leaves suggest molecular inactivation. (Casey-Arizona)
W71-08451

THE EFFECT OF WATER STRESS ON INDOLEACETIC ACID OXIDASE IN PEA PLANTS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
B. Darbyshire.
Plant Physiology, Vol 47, No 1, p 65-67, Jan 1971. 2 fig, 1 tab, 14 ref.

Descriptors: *Plant growth substances, *Moisture stress, *Biochemistry, Plant physiology, Laboratory tests, Colorimetry, Enzymes.
Identifiers: *Auxin, *Seedlings.

It has been suggested that the presence of indoleacetic acid (IAA) oxidase in plant tissue is a measure of the physiological age of the tissue. Pea plant (Pisum sativum) seedlings were subjected to -10atm water stress for 6 hours then returned to water to recover for a further 3 hours. Homogenate IAA oxidase fractions were determined by colorimetry and protein fractions by UV absorption. Two protein peaks were isolated. One peak was associated with the first IAA oxidase peak, and increased during water stress. The second peak could not be associated with an IAA oxidase peak and decreased after water stress. IAA oxidase was 116% of control in stressed plants, and surprisingly, 162% in recovered plants. Interpretation of the results requires further data. (Casey-Arizona)
W71-08463

ECO-PHYSIOLOGY OF WESTERN AUSTRALIAN PLANTS,
Western Australia Univ., Nedlands. Dept. of Botany.
B. J. Grieve, and E. O. Hellmuth.
Oecologia Plantarum, Vol 5, No 1, p 34-67, 1970. 4 fig, 3 tab, 68 ref.

Descriptors: *Physiological ecology, *Moisture stress, *Arid lands, *Xerophytes, *Plant physiology, Transpiration, Leaves, Stomata, Drought resistance, Photosynthesis, Plant morphology, Cuticles, Soil-water-plant relationships, Biological communities, Water loss, Heat resistance, Turgidity, Root systems, Soil types, Mode of action, Drought tolerance.
Identifiers: *Western Australia, *Sclerophylls, *Adaptations, *Water potential, *Drought avoidance, Photosynthetic efficiency, Transpiration ratio, Root hairs.

Comparative accounts are given of 27 species of Western Australian native plants growing in various soil types in climatic regions varying from temperate to arid. A wide range of physiological variables were studied in relation to adaptive morphological structures in leaf types and root systems. Particularly important with reference to summer drought were water relations, heat resistance and photosynthetic efficiency. While drought avoidance was the commonest form of drought resistance, many drought tolerant forms were also present. Microphylly, vertical leaf orientation, sunken stomata, thick cuticles, hairs and shiny surfaces were common xeromorphic adaptations resulting in lowered leaf temperatures and reduced water loss. Common adaptive adjustments to water loss were increased reflectance, decreasing heat load and increased stomatal pathway resistance. Summer water loss was also significantly less in plants with tomentose leaves as opposed to glabrous leaves. Sunken stomata probably result in less photosynthesis reduction than transpiration reduction, resulting in a favorable transpiration ratio. Deep tap root systems occur in several species and are adaptations to drier conditions. The temperature tolerances of arid area plants are large and net photosynthesis temperature optima are higher. Saltbushes appear to be able to absorb moisture from a nearly saturated atmosphere. (Casey-Arizona)
W71-08474

VEGETATION CHANGE FROM A SAND DUNE COMMUNITY TO A SALT MARSH AS RELATED TO SOIL CHARACTERS IN MARIUT DISTRICT, EGYPT,
Alexandria Univ. (Egypt). Dept. of Botany.
Malak R. Rezk.
Oikos, Vol 21, No 2, p 341-343, 1970. 1 tab, 6 ref.

Descriptors: *Dunes, *Sands, *Salt marshes, *Halophytes, *Soil alkalinity, Calcium carbonate, Vegetation, Ecosystems, Habitats, Sodium, Calcium, Soil moisture, Hygroscopic water, Biological communities, Soil salinity.
Identifiers: *Egypt, *Mediterranean climate, *Exchangeable sodium.

Salt marshes, with their characteristic halophyte plant communities, are found along the Mediterranean coast west of Alexandria wherever there are depressions. Between these and the coast itself are unstabilized sand dunes, which then grade into stabilized dunes, and farther south into salt marshes. Soil salinity and alkalinity varies in these different areas and an attempt was made to relate it to vegetation. The plant communities were described and soil chemical properties measured at 5 different points along a transect between coastal dunes and salt marshes. Exchangeable Ca decreased from unstabilized to stabilized dunes, then increased sharply in the marsh soil, probably reflecting the importance of Ca carbonate in semiarid soil particle stabilization. Soil hygroscopic moisture increased progressively from coastal dunes to marshes. Soil salinity was similar in the dune habitats and sharply increased in the marshes. In the dunes, plant species composition varied directly with stability. In the more stable areas, organic litter buildup facilititated the occurrence of new species. The very saline marshy areas supported glycophytes. (Casey-Arizona)
W71-08475

FURTHER STUDIES OF EUROTIA LANATA GERMINATION IN RESPONSE TO SALINITY,
Utah State Univ., Logan. Dept. of Range Science; and Utah State Univ., Logan. Ecology Center.
For primary bibliographic entry see Field 03C.
W71-08481

PRIMARY PRODUCTIVITY IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08778

OBSERVATIONS ON THE ZOOPLANKTON OF THE EASTERN SANTA BARBARA CHANNEL FROM MAY, 1969 TO MARCH, 1970,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08779

SOME POLYCHAETOUS ANNELIDS FROM THE SANTA BARBARA SHELF AREA,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08781

NOTES ON SOME OPHIUROIDS FROM THE SHELF OFF SANTA BARBARA,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08782

IMBIBITION BY ALKALI SACATON SEEDS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
O. D. Knipe.
Journal of Range Management, Vol 24, No 1, Jan 1971, p 71-73.

Descriptors: *Seeds, *Range grasses, *Absorption, *Moisture uptake, Moisture content, Colorado.
Identifiers: *Seeds, *Range grasses, *Imbibition, *Alkali sacaton, *Seed-water-relations, Imbibition rate, Exudation losses.

Air-dry samples of large and small alkali sacaton (Sporobolus airoides Torr.) seeds were sandwiched between blotters saturated with distilled water and imbibed for various periods of time. After imbibition the seeds were weighed and the percent of weight change (dry weight basis) was determined. Imbibition of water by the seeds progressed through three phases: (1) an initial period of rapid uptake lasting for approximately 4 hours, (2) a tapering-off period of slow or negative uptake (the large seeds actually lost weight during this period) that lasted approximately 7 hours in the large seeds and 2 hours in the small seeds, and (3) a period of gradual increase that lasted until sprouting occurred: the 28th hour in large and the 32nd hour in small seeds. The second stage apparently was due to exudation loss and possibly some loss of a mucilaginous membrane which envelops the seeds. The smaller seeds contain a greater proportion of the mucilage and thus imbibed more moisture and at a higher rate than the large seeds.
W71-08843

LIGHT DELAYS GERMINATION OF ALKALI SACATON,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
O. D. Knipe.
Journal of Range Management, Vol 24, No 2, p 152-154, Mar 1971.

Descriptors: *Seeds, *Range grasses, *Germination, *Light, New Mexico.
Identifiers: *Seeds, *Range grasses, *Germination, *Light effects, *Alkali sacaton, Light-germination-relations.

To determine if alkali sacaton is negatively photoblastic, seeds were placed in black petri dishes on moist blotters and allowed to imbibe moisture for 30 min at 90F. After imbibition the seeds were subjected to light treatment of 1000 ft-c intensity for periods ranging from flash to constant exposure. Exposure of alkali sacaton seeds to light for a few seconds after imbibition delayed germination 24 hr, exposure for 9 to 13 hr delayed germination 28 hr, exposure for more than 13 hr delayed germination 72 hr and continuous exposure reduced germination 40 percent.
W71-08847

IMPROVING SURVIVAL OF ALKALI SACATON SEEDLINGS UNDER ADVERSE CONDITIONS,
Rocky Mountain Forest and Range Experimen Station, Fort Collins, Colo.
Earl F. Aldon.
USDA Forest Serv Res Note RM-177. 3 p.

Descriptors: *Erosion control, *Vegetation effect *Watershed management, *Soil stabilization Vegetation establishment, New Mexico, Germina tion.
Identifiers: Plant establishment, Floodplain sta bilization.

Alkali sacaton (Sporobolus airoides (Torr.) Torr seedlings have little chance of surviving adver field conditions unless seeds are planted on moi soil, on an agar plate, under mulch, and watere after 5 days.
W71-08850

A COMPARISON OF SEVERAL STATISTICA MODELS IN FOREST BIOMASS AND SU FACE AREA ESTIMATION,
Southeastern Forest Experiment Station, Ashevil N.C.
Hans T. Schreuder, and Wayne T. Swank.
In: Forest Biomass Studies, Misc Pub 132, Life S and Agr Exp Sta, Univ of Maine at Orono, p 12 136, 1971. 2 fig, 3 tab, 14 ref.

Descriptors: *Statistical models, *Biomass, *Wh pine trees, *Regression analysis, North Caroli Vegetation, Leaves, Estimating, Mathematics, S face.
Identifiers: Coweeta Hydrologic Laboratory.

The squared correlation and log likeliho techniques are discussed and used to evalu statistical estimation models for eastern white p biomass and surface area data. Three a priori lin models are considered: (1) an unweighted untra formed model, (2) a weighted untransform model, and (3) a log-log transformation model addition, a comprehensive model is conside which includes two of the a priori models and o standard models as special cases. The likeliho approach is demonstrated to be a useful statist tool for comparing dimensional tree compon models. The R sq criteria can be mislead Specifically R sq gave misleading results in sel ing the unweighted untransformed model over weighted untransformed model in five out of e cases. Considering only the a priori models, biomass parameters would be estimated by the log transformation and the weighted linear mo would be used for the surface area parameters. double square root transformation appears to promising alternative model.
W71-08858

2J. Erosion and Sedimentation

SWASH ZONE PROCESSES: AN EXAM TION OF WATER MOTION AND THE RE TIONS BETWEEN WATER MOTION FORESHORE RESPONSE ON SOME MI SAND AND SHINGLE BEACHES, KAIKOU NEW ZEALAND,
Robert M. Kirk.
Coastal Research Notes, Vol 3, No 4, p 1-3, 1971. 3 p, 1 ref.

Descriptors: *Beaches, *Subsurface investiga *Sedimentology, *Geomorphology, Sedi transport, Groundwater movement, Soil movement, Sands, Ocean waves, Flow ch teristics, Instrumentation, Analytical techn Tidal effects, Data collections, Particle size.
Identifiers: Backwash, Swash zone.

Processes responsible for the production modification of morphological and sediment cal changes on the subaerial beach face we vestigated on some mixed sand and s beaches, Kaikoura, New Zealand. An instru

stem was constructed for the measurement of
ow speeds, pressures, asymmetries, depths, levels
groundwater storage and outflow, and of flow
rations. In association with the observations of
ese flow processes several responses to flow
gime were also sampled. These included altera-
ns to grain size parameters of bed sediments,
nsport rates of solids in the swash and backwash,
rtical distributions of sediment in both swash and
ckwash, and changes in bed elevation. An elec-
-mechanical force plate dynamometer was em-
oyed for the measurement of flow speed, force,
wer and duration and a small parallel wire gage
sed depth fluctuations in swash and backwash
ws. The output from both of these units was
corded on a strip chart for later analysis. A wide
ge of breaker heights, periods and types is
eived at four stations. More than 3,000 in-
idual measurements of swash/backwash flow
nditions were obtained from these four profiles
breaker heights of from 1.5 to 10.0 feet and for
aker periods ranging from 7.5 to 11.0 seconds.
oodard-USGS)
1-08325

ANSPORT AND DISPERSION OF UORESCENT TRACER PARTICLES FOR E FLAT-BED CONDITION, RIO GRANDE NVEYANCE CHANNEL, NEAR BERNARDO, W MEXICO,
ological Survey, Washington, D.C.
. Rathbun, V. C. Kennedy, and J. K.
bertson.
sale by the Superintendent of Documents, US
ernment Printing Office, Washington, DC,
02, Price $0.65. Geological Survey Professional
er 562-I, 1971. 56 p, 42 fig, 19 tab, 25 ref, 3 ap-
d.

criptors: *Sediment transport, *Tracers,
orescence, *Rio Grande, *New Mexico,
lytical techniques, Weirs, Correlation analysis,
vial channels, Sediment distribution, Sedimen-
n rates, Channel morphology, Particle size,
mentology.
tifiers: *Bernardo (N Mex), *Flat-bed chan-
Conveyance channel, Fluorescent tracers.

uorescent tracer technique was applied to a
y of the rates of transport and dispersion of
ment particles of various diameters and specific
ities for the high-velocity flat-bed conditions of
ial-channel flow. Two runs were conducted in
Rio Grande conveyance channel near Bernar-
New Mexico, on December 13 and 14, 1966.
instantaneous point source of fluorescent
rial was used in each run. Samples of the bed
rial moving on or near the bed surface were
ned throughout the passage of the tracer
es with the 'dustpan' sampler especially
ned for this study. The sediment-transport
calculated from the fluorescent tracer experi-
s were about 57 and 14 percent larger than the
ent-transport rates measured at the weir in
1 and 2, respectively. The agreement in run 2
good because positive and negative errors for
different sieve classes were compensating.
odard-USGS)
-08328

ROLOGY OF QUATERNARY DELTA OSITS OF THE MISSISSIPPI RIVER,
gical Survey, Baton Rouge, La.
H. Jones.
ydrology of Deltas, Vol 1, Proceedings of the
arest Symposium, May 1969, International
iation of Scientific Hydrology Publication No
49-63, 1970. 15 p, 9 fig, 30 ref.

iptors: *Deltas, *Mississippi River, *Sedi-
ation, *Stratigraphy, Deposition (Sediments),
hydrology, Hydrogeology, Runoff, Alluvial
els, Saline waters, Saline water systems,
water intrusion, Water quality, Water
istry, Water resources development.
fiers: Mississippi Delta.

Quaternary delta deposits of the Missisiippi River, together with interbedded marine sediments, have a cumulative maximum thickness greater than 13,000 feet, of which the delta deposits constitute perhaps half. They underlie a coastal belt some 300 miles in length, and extend more than 150 miles southward from the coastline of southwestern Louisiana beneath the Gulf of Mexico. The late Quaternary deltaic mass contains almost no fresh groundwater, although streams that cross it carry runoff from 60% of the conterminous United States. This seeming paradox is caused by expulsion of saline waters from incompetent prodelta clay beds overridden by advancing deltaic sediments having a common framework and parent trunkstream source. Distributary channel deposits terminate gulfward in marine clay and join headwards with those of the trunk stream to form an integrated system of conduits, through which water expelled from compacting sediments is discharged upvalley. Because the delta is still growing, this discharge is continuing. It causes landward movements of saline groundwater, threatens some existing fresh-water supplies, and must be considered carefully in any developments of fresh-water resources in the delta. (Knapp-USGS)
W71-08343

SOME ASPECTS OF EROSION AND SEDIMENTATION IN AN ARCTIC DELTA DURING BREAKUP,
Louisiana State Univ., Baton Rouge, and Office of Naval Research, London (England).
H. J. Walker.
Also published as Louisiana State Univ. Coastal Studies Inst. Technical Report no 90, Nov 1970. In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Syposium, May 1969, International Association of Scientific Hydrology Publication no 90, p 209-219, 1970. 11 p, 19 fig, 15 ref. Contract no N00014-69-A-0211-0003, Project no 388 002 of the Geography Programs, ONR.

Descriptors: *Sediment transport, *Ice breakup, *Deltas, *Alaska, *Artic Ocean, Rivers, Lake ice, Erosion, Sedimentation, Sediment distribution, Permafrost, Melt water, Ablation, Streamflow.
Identifiers: *Colville River (Alaska).

In arctic deltas, the character and amount of erosion and sedimentation are affected by numerous factors not normally operating in other deltas. A long period of snow and ice cover, continous permafrost, a thin active layer and extreme variation in discharge are among some of the more important conditions involved. The Colville River, which drains much of arctic Alaska, has nearly half of its discharge and some three-fourths of its sediment load concentrated into the three- to four-week period accompanying and immediately following breakup. During this period thermoerosional niches form in the frozen riverbanks. The undercutting is frequently responsible for bank collapse and rapid bank retreat. Likewise, the bulk of the delta's deposition occurs during this short period of time. As sediment is deposited on bottom-fast river ice and on the sea at the front of the delta, much of it is often lost to the delta during breakup. (Woodard-USGS)
W71-08344

TRANSPORT PROCESSES OF PARTICLES IN DILUTE SUSPENSIONS IN TURBULENT WATER FLOW - PHASE I,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 08B.
W71-08492

RECOVERY OF MICA FROM SILT DEPOSITS IN THE NOLICHUCKY RESERVOIR, TENNESSEE,
Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Center.
For primary bibliographic entry see Field 05D.
W71-08523

FORMATION OF SULFUR-BEARING MUDS IN RECENT CRATER LAKES, (RUSSIAN: USLOVIYA OBRAZOVANIYA SERONOSYNKH ILOV V SOVREMENNYKH KRATERNYKH OZERAKH),
Gosudarstvennyi Nauchno-Issledovatelskii Institut Gornokhimicheskogo Syrya, Lyubertsii (USSR); and Akademiya Nauk SSR, Moscow. Institut Geokhimii i Analitcheskoi Khimii.
For primary bibliographic entry see Field 02H.
W71-08538

IRRIGATION PRACTICES AND IRRIGATION EROSION OF SOILS, (RUSSIAN: TEKHNIKA POLIVA I IRRIGATSIONNAYA EROZIYA POCHV),
For primary bibliographic entry see Field 03F.
W71-08585

TRANSPORT AND DEPOSITION OF FLOOD SEDIMENT, SANTA BARBARA CHANNEL, CALIFORNIA,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05C.
W71-08797

HYDROCARBON CONTENT OF SANTA BARBARA CHANNEL SEDIMENTS,
University of Southern California, Los Angeles. Dept. of Geological Sciences; and Cincinnati Univ., Ohio. Dept. of Chemistry; and Gulf General Atomic Co., San Diego, Calif.
For primary bibliographic entry see Field 05C.
W71-08799

GENERAL CHARACTERISTICS OF NEARSHORE SEDIMENTS FROM EL CAPITAN TO VENTURA, CALIFORNIA, 1969-1970.
University of Southern California, Los Angeles. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05C.
W71-08800

STREAM SEDIMENT: AN ENVIRONMENTAL PROBLEM,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 04C.
W71-08821

PRINCIPAL COMPONENTS ANALYSIS OF WATERSHED VARIABLES AFFECTING SUSPENDED SEDIMENT DISCHARGE AFTER A MAJOR FLOOD,
Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
Henry W. Anderson.
Symposium on the Results of Research on Representative and Experimental Basins. International Association of Scientific Hydrology Publication No 96: 404-416, 1970.

Descriptors: *Erosion, *Suspended load, *Watershed management, *Analytical techniques, *Accelerated erosion, Lumbering, Regression analysis, Watersheds, Variability, Geomorphology, Topography, Drainage patterns (Geologic), Channels, Geologic control, Land use, Grasslands, Highways, Slope stability, California.
Identifiers: *Mountain watersheds, Logging, Multivariate analysis, Flow paths.

Suspended sediment discharge from 31 watersheds after two major floods in northern California exceeded pre-flood amounts by as much as 5 times. Increases the first year after the 1964 flood ranged from 0 to 7300 metric tons per square kilometer (21000 tons per square mile). Increased sediment discharge from watersheds depended on the relative size of flood, topography, and land use in each watershed. Poor land-use practices--specifically, placing logging roads adjacent to streams and temporary log storage areas (landings) in draws--was

associated with 70 percent greater increases in sedimentation after floods. High-elevation watersheds had the greatest increases--3 times more than low elevation watersheds. Equations related the decline of sedimentation to the year since each flood. Second year increases averaged 94 percent of first year. By the third year increases had declined to 66 percent of the first year increases. The amount and duration of increases in sediment discharge associated with changes brought about by large floods will affect watershed management decisions and programs requiring estimates of long-term sedimentation from watersheds.
W71-08837

CHARACTERISTICS AND PROCESSES OF SOIL PIPING IN GULLIES,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
Burchard H. Heede.
USDA Forest Serv Res Pap RM-68, 1971. 15 p, illus.

Descriptors: *Gullies, *Soil erosion, *Permeability, Soil stabilization, Colorado.
Identifiers: Exchangeable Sodium Percentage.

Soil piping processes and soil development were studied as a result of combined pipe and gully actions. Soils from gully side slopes with and without pipes showed a highly significant difference in exchangeable sodium percentage (ESP). Piping soils had a layer permeability 2 to 12 percent of that of soils without pipes. Both soils were fine texture. The interior of one soil pipe was thoroughly inspected, surveyed, and photographed from inlet to outlet. Based on the survey, and chemical and mechanical analyses, it is proposed that soil pipes on the Alkali Creek watershed developed mainly from soil cracks. Other causes such as rodent holes or dead root canals are presumed possible, but were not verified. Gullies, high exchangeable sodium percentage, low gypsum content, and fine-textured soils with montmorillonite clay appear to be prerequisites to the formation of soil pipes on the study area. ESP was significantly higher in piping soils in place than in those fallen from the gully side slopes. ESP decreased also with increasing time since fall. Natural reclamation of the fallen soils led to processes initiating gully stabilization.
W71-08842

MEASUREMENT OF CREEP IN A SHALLOW, SLIDE-PRONE TILL SOIL,
Pacific Northwest Forest and Range Experiment Station, Juneau, Alaska. Inst. of Northern Forestry.
D. J. Barr, and D. N. Swanston.
American Journal of Science, Vol 269, p 467-480, Dec 1970. 5 fig, 2 tab, 5 ref.

Descriptors: *Creep, *Soil mechanics, *Slope stability, *Soil dynamics, Clear-cutting, *Landslides, *Glacial soils, Mass wasting, Soil erosion, Engineering geology, Soil engineering, Soil physical properties, Alaska.
Identifiers: Southeast Alaska, Logged areas, Strain probes.

Strain probe measurements of creep in a steep glacial till soil were made in an area of active soil movement in southeastern Alaska. Estimates of creep indicate rates in excess of 0.06 m per year at the surface, rapidly decreasing to zero at an impermeable lower soil boundary. The soil apparently moves as a flow mass with no well-defined shear zones. Inferences from probe data and deformation of paraffin rods installed in active slopes suggest that movement exists the year round with the highest rate of movement occurring in the fall and spring when soil moisture is highest.
W71-08852

SEDIMENT MOVEMENT IN A POOL AND RIFFLE STREAM,
North Central Forest Experiment Station, St. Paul, Minn.
Edward A. Hansen.
International Symposium on the Results of Research on Representative and Experimental Basins, Wellington, New Zealand, Dec 1-8, 1970, IASH-VNESCO Pub 96, p 541-561, illus.

Descriptors: *Sediment transport, *Sediment discharge, *Particle size, *Bank erosion, *Bed load, Sediment load, Sediment yield, Stream erosion, Bottom sediments, River beds, Scour, Deposition (Sediments), Michigan.
Identifiers: *Sediment sampling, *Total sediment load.

A sediment budget was constructed for a pool and riffle stream along which eroding streambanks were the dominant sediment source. Total sediment load was measured with a DH-48 sediment sampler at artificial sills placed on the streambed at each of the five sampling stations, which eliminated an 'unsampled zone'. Supplementary data collected at each station and an independent check with a long-term reservoir fill rate indicated the 'sill samples' were accurate measures of total load for a wide range of sampling site hydraulic characteristics. The total load data were used to determine the impact of eroding bank sediments on both sediment load and streambed composition. Total load increased 530 percent along a 26-mile (42 kilometers) section of main channel; most of this increase came from eroding streambanks. However, particle-size distribution of the predominantly sand-size sediment load remained the same along the section of stream. The proportion of streambed area in sand decreased downstream, while the proportion in cobble and boulder increased -- an apparent result of increased stream gradient. Although sediment load was related to stream discharge, it was believed to be dependent upon sediment delivery rate to the stream.
W71-08862

DEPOSITION OF SEDIMENT IN TRANSIENT FLOW,
South Dakota State Univ., Brookings. Dept. of Civil Engineering; and Federal Highway Administration, Kansas City, Kans. Kansas Div.
Fred F. M. Chang, and Dennis L. Richards.
Supported by National Science Foundation and South Dakota Water Resources Institute. ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY6, Paper 8191, p 837-849, June 1971. 13 p, 4 fig, 1 tab, 14 ref, append. Project 3,569 SRI.

Descriptors: *Sediment transport, *Unsteady flow, *Deposition (Sediments), *Mathematical models, *Computer programs, Slopes, Alluvial channels, Suspended load, Bed load, Equations, Estuaries, Tidal effects, Numerical analysis.
Identifiers: Transient flow.

An analytical method of predicting the change in reiverbed elevation at transient phases is developed. A computer program is presented so that a sample computation can be made to check the stability and convergency of the method. For channels in which the sediment-laden water can be considered completely homogeneous and in which the velocity can be considered uniform over the cross section, equations of continuity and the equation of motion of sediment-laden water are presented. Introducing the assumption that the difference between the original bed slope and the new bed slope within a short period is very small, these three basic partial differential equations are successfully reduced to two partial differential equations. The method of characteristics is then employed to solve for the mean velocity and the mean depth of flow. In order to estimate the sediment deposit thickness, the equation of continuity for sediment is transformed directly to finite-difference form. (Knapp-USGS)
W71-08908

THE DEGRADATION OF LIAS CLAY SLOPES IN AN AREA OF THE EAST MIDLANDS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
Richard John Chandler.
Quarterly Journal of Engineering Geology, Vol 2, No 3, p 161-176, February 16, 1970. 16 p, 7 fig, 3 plate, 14 ref, append.

Descriptors: *Landslides, *Clays, *Soil mechanics, Soil strength, Till, Groundwater, Geology, Hydrogeology, Degradation (Stream), Geomorphology, Consolidation.
Identifiers: Rutland (England), Northamptonshire (England).

A sequence of slope degradation was studied in an area in Rutland and Northamptonshire, England where a more rigid layer generally overlies a thick deposit of fissured, heavily over-consolidated clay. The capping of Inferior Oolite or boulder clay is locally associated with relatively steep slopes in the Upper Lias Clay with the consequence that shallow rotational slides have developed. The limiting angle of slope on which movement has occurred is about 9 deg and the maximum stable slope is 10 1/2 deg. Because of the comparative freshness of the landslide topography the virtual complete absence of such features as ungrassed scarps is unusual. Apparently, degradation is taking place only very slowly under present climatic conditions; asymmetrical valleys which have slides developed on the steeper southern slopes suggest that some of the movements may date back to the periglacial conditions of the Late Glacial period. (Knapp-USGS)
W71-08929

2K. Chemical Processes

WATER RESOURCES DATA FOR COLORADO 1969: PART 2. WATER QUALITY RECORDS.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W71-08324

HYDROLOGY OF QUATERNARY DELTAIC DEPOSITS OF THE MISSISSIPPI RIVER,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02J.
W71-08343

ISOTOPE COMPOSITION OF UNDERGROUND BRINES AS AN INDICATOR OF THEIR ORIGIN (RUSSIAN: OB IZOTOPNOM SOSTAVE PODZEMNYKH RASSOLOV KAK POKAZATELE IKH PROISKHOZHDENIYA),
Institut Prirodnogo Gana. Moscow (USSR).
For primary bibliographic entry see Field 02F.
W71-08367

ISOTOPE COMPOSITION OF URANIUM (U-234, U-238) IN WATERS AND BOTTOM SEDIMENTS OF LAKE BALKHASH, AND AGE OF THE LAKE (RUSSIAN: IZOTOPNYY SOSTAV URANA (U-234, U-238) V VODAKH I DONNYKH OSADKAKH OZ. BALKHASH I EGO DOLZHITEL'NOST' SUSHCHESTVOVANIYA VODOYEMA),
Akademiya Nauk Kirghiz SSR, Frunze. Institute of Physics and Mathematics.
For primary bibliographic entry see Field 02H.
W71-08368

REACTIONS OF A STRONGLY BASIC ION EXCHANGE RESIN WITH DILUTE AQUEOUS SOLUTIONS IN A COLUMNAR SYSTEM,
Michigan Univ., Ann Arbor. Div. of Sanitary and Water Resources Engineering.
For primary bibliographic entry see Field 05D.
W71-08391

GOLD CONTENT OF NATURAL WATERS, COLORADO,
Geological Survey, Helena, Mont.
A. W. Gosling, E. A. Jenne, and T. T. Chao.
Economic Geology, Vol 66, No 2 p 309-313, Apr, 1971. 4 p, 1 fig, 2 tab, 7 ref.

escriptors: *Gold, *Geochemistry, *Neutron activation analysis, *Water chemistry, Neutron absorbtion, Analytical techniques, Hydraulic mining, lacer mining, Chemical analysis, Colorado, Rocky lountain region, Mine drainage, Waste dumps, pectroscopy, Aqueous solutions, Chemical recipitation, Dispersion, Solvent extractions.
lentifiers: *Idaho Springs (Colo), *Clear Creek Colo), Gold concentrations (Natural waters), Hydrogeochemical gold prospecting.

eutron activation analysis of 67 samples of water aining from gold-barren and gold-enriched sedentary, igneous, and metamorphic rocks of olorado Front Range reveals a relatively small nge in total gold content (nondetectable to 150 nograms per liter). 'Solute' gold concentrations re generally higher than particulate gold concentions and both were unrelated to rock or water es. The data suggest the occurrence of a spring sh out of 'solute' gold in groundwater discharge ring the snow-melt recharge period but indicate t direct hydrogeochemical prospecting for gold npromising. (J. Glasby-USGS)
71-08518

CULIARITIES IN THE GEOCHEMISTRY OF SIUM IN GROUNDWATER OF VARIOUS EP ZONES OF THE EARTH'S CRUST (RUSAN: OSOBENNOSTI GEOKHIMII TSEZIYA V DZEMNYKH VODAKH RAZLICHNYKH UBINNYKH ZON ZEMNOY KORY),
-Union Scientific Research Inst. of Hydrogeolond Engineering Geology, Moscow (USSR).
. Kraynov.
okhimiya, No 8, p 979-987, Aug 1970. 9 p, 4 fig, b, 18 ref.

criptors: *Geochemistry, *Cesium, *Water mistry, Groundwater, Magmatic water, Alkali als, Pegmatites, Potassium, Hydrogeology.
ntifiers: *USSR, Greater Caucasus, lrogeochemistry, Magmatism.

arying rate of cesium migration was determined waters of different horizons of the earth's crust. ium is most mobile in carbonate and termal ers of regions of recent and Late-Quaternary matism. In the Greater Caucasus the cesium centration increases as areas of carbonate ther- waters approach foci of Late-Quaternary magsm. In groundwaters of the supergene zone um is the least mobile of alkali elements. Of the alkali elements, cesium exhibits the widest e of differences in migration capacities for er and lower horizons of the earth's crust. efson-USGS)
-08537

IOACTIVE ELEMENTS AND DEUTERIUM GROUNDWATERS OF THE BUKHAROSHINSKIY ARTESIAN BASIN (RUSSIAN: IOAKTIVNYYE ELEMENTY I DEYTERIY PODZEMNYKH VODAKH BUKHAROSHINSKOGO ARTEZIANSKOGO BASNA),
lemiya Nauk SSR, Moscow. Inst. of Water arch; and Vsesoyuznyi Nauchno-Issledovatel- Institut Yadernoi Geofiziki i Geokhimii, ow (USSR).
Alekseyev, R. P. Gottikh, V. N. Soyfer, and Brezgunov.
himiya, No 12, p 1483-1494, Dec 1970. 12 p, 7 ref.

riptors: *Radioactive dating, *Uranium isotopes, *Radium radioisotopes, *Deuteri- 'Geologic time, Groundwater, Mesozoic era, nt epoch, Infiltration, Sedimentation, hemistry.
ifiers: *USSR, *Kazakhstan, Amu Darya , Sedimentation waters, Jurassic period, ceous period.

istribution of uranium, radium, and deuteri- groundwaters of a Mesozoic cross section of ukharo-Karshinskiy artesian basin reflects a change in the geochemical state of the waters, with a definite correlation between radium and deuterium content. Data on uranium, radium, and deuterium content in combination with data on the geological structure of the basin show that the present character of the groundwaters of the basin is the result of two infiltration periods--the Mesozoic and the recent one--and make it possible to determine zones of infiltration water intrusion and the degree to which connate waters are diluted by them. Data on uranium, radium, and deuterium content in waters of Jurassic, Lower Cretaceous and Cenomanian-Albian water bearing complexes point to the connate nature of waters and to excellent isolation of the complexes from one another. From the content of radioactive elements and deuterium it is possible to solve problems of water genesis, determine the direction of flow of infiltration waters and to assess the extent of their supply. (Josefson-USGS)
W71-08539

LITHIUM, RUBIDIUM AND CESIUM ABUNDANCE IN WATERS AND SOLID EJECTAMENTA OF MUD VOLCANOES OF THE KERCH-TAMAN REGION (RUSSIAN: RASPROSTRANENIYE LITIYA, RUBIDIYA I TSEZIYA V VODAKH I TVERDYKH VYBROSAKH GRYAZEVYKH VULKANOV KERCHENSKO-TAMANSKOY OBLASTI),
Vsesoyuznyi Neftyanoi Nauchno-Issledovatelskii Geolograzvedochnyi Institut, Leningrad (USSR).
I. A. Khod'kova, and S. D. Gemp.
Geokhimiya, No 12, p 1495-1503, Dec 1970. 9 p, 2 tab, 8 ref.

Descriptors: *Volcanoes, *Alkali metals, *Cesium, *Trace elements, *Geochemistry, Boron, Strontium radioisotopes, Geologic time, Brines, Clays.
Identifiers: *USSR, *Crimea, Kerch Strait, Lithium, Rubidium, Barium, Ejectamenta, Breccia.

The solid ejectamenta of mud volcanoes of the Kerch-Taman' region are shown to contain large amounts of lithium, rubidium, boron, barium, strontium and other elements as compared with the sedimentary rocks developed outside the zone of mud volcano influence. Waters of the mud volcanoes contain 10-100 times more lithium, rubidium, cesium and boron than those of the world's oceans. In waters and breccia of two volcanoes in particular--the Shugo and Gladkovskiy--lithium, rubidium and cesium content is 3-5 times that of other volcanoes. Generally, waters and gases of the mud volcanoes of the region take an active part in forming the chemical composition of natural brine of lakes of the Kerch Peninsula and of Kerch iron ores of the Cimmerian age. (Josefson-USGS).
W71-08540

URANIUM, THORIUM AND RARE-EARTH ELEMENTS IN THERMAL WATERS OF KAMCHATKA (RUSSIAN: URAN, TORIY I REDKOZEMEL'NYYE ELEMENTY V TERMAL'NYKH VODAKH KAMCHATKI),
Institut Vulkanologii, Petropavlovsk-Kamchatskii (USSR).
N. I. Udal'tsova, and L. L. Leonova.
Geokhimiya No 12, p 1504-1510, Dec 1970. 7 p, 2 tab, 24 ref.

Descriptors: *Thermal water, *Geochemistry, *Uranium radioisotopes, Chlorides, Sodium, Sulfates, Rocks, Acidic water, Igneous rocks.
Identifiers: *USSR, *Kamchatka, Thorium, Rare-earth elements.

The contents of uranium, thorium and rare-earth elements in chloride-sodium carbonate, sulfate-chloride-sodium carbonate, sulfate and carbonate thermal waters of Kamchatka were determined with an error of plus or minus 25-30%. Thorium: uranium and rare-earth: thorium ratios are calculated. Minimum concentrations of uranium, thorium and rare-earth elemets are found in deep chloride-sodium carbonate thermal waters. In sulfate waters the uranium concentration increases twofold and that of thorium and rare-earth elements 10- and 5- fold, respectively. It is assumed that uranium, thorium and rare-earth elements are present in a dissolved state in all types of waters and that country rocks are the source of these elements in the waters. A change in the chemistry of chloride-sodium carbonate and carbonate waters has no significant effect on the uranium concentration in them. The determining factor in this case is the low uranium content in the volcanogenic rocks of Kamchatka. Studies do not solve the problem of the juvenile component for iranium, thorium and rare-earth elements in thermal waters but its fraction is undoubtedly very small. (Josefson-USGS)
W71-08541

BIOGEOCHEMISTRY OF A RESERVOIR ECOSYSTEM,
Oklahoma State Univ., Stillwater. Dept. of Chemistry; and Oklahoma State Univ., Stillwater. Dept. of Zoology; and Oklahoma State Univ., Stillwater. Reservoir Research Center.
For primary bibliographic entry see Field 05A.
W71-08685

THE APPLICATION OF NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY TO PESTICIDE ANALYSES,
Environmental Protection Agency, Athens, Ga. Southwest Water Lab.
For primary bibliographic entry see Field 05A.
W71-08833

THE ENHANCEMENT OF ASYMMETRY EFFECTS IN NMR BY INTERMOLECULAR HYDROGEN BONDING,
Environmental Protection Agency, Athens, Ga. Southwest Water Lab.
For primary bibliographic entry see Field 05A.
W71-08834

EU (DPM)3 TRANSANNULARLY INDUCED PARAMAGNETIC CHEMICAL SHIFTS IN THE PMR SPECTRA OF ENDRIN, DIELDRIN, AND PHOTODIELDRIN,
Environmental Protection Agency, Athens, Ga. Southwest Water Lab.
For primary bibliographic entry see Field 05A.
W71-08835

LONG-RANGE COUPLINGS IN THE CHLORINATED POLYCYCLODIENE PESTICIDES,
Environmental Protection Agency, Athens, Ga. Southwest Water Lab.
For primary bibliographic entry see Field 05A.
W71-08836

SURFACE SALINITY AND TERMPERATURE 'SIGNATURES' IN THE NORTHEASTERN PACIFIC,
Scripps Institution of Oceanography, La Jolla, Calif.
Martha W. Evans.
Journal of Geophysical Research, Vol 76, No 15, p 3456-3461, May 20, 1971. 6 p, 5 fig, 1 tab, 9 ref.
ONR Contract N000 14-69-A-0200-6006.

Descriptors: *Water temperature, *Salinity, *Pacific Ocean, Sea water, Water chemistry, Sampling, Surveys, Data collections, Bathythermographs.
Identifiers: Salinity-temperature relations (Pacific).

In general, sea-surface temperatures increase to a maximum toward the equator, and surface salinity reaches a maximum in the subtropics. Surface waters may be roughly classified into areas where temperature and salinity are positively correlated and areas where they are negatively correlated. Continuous-record data show that the transitions from one regime to the other take place abruptly in

some regions. In addition, the continuous records of salinity and temperature provide a means of immediately recognizing positions of oceanic fronts and advective phenomena. (Knapp-USGS)
W71-08913

2L. Estuaries

ESTUARINES, BAYS AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 05B.
W71-08322

HYDROBIOLOGICAL CHARACTERISTICS OF SHARK RIVER ESTUARY, EVERGLADES NATIONAL PARK, FLORIDA,
Geological Survey, Tallahassee, Fla.
Benjamin F. McPherson.
Geological Survey Open-file Report 71002 (Florida), Dec 1970. 113 p, 19 fig, 18 tab, 26 ref, append.

Descriptors: *Wetlands, *National Parks, *Florida, *Estuaries, *Water quality, Water level fluctuations, Water pollution effects, Droughts, Productivity, Wet seasons, Marshes, Swamps, Aquatic environment, Dissolved oxygen, Salinity.
Identifiers: *Everglades National Park (Fla).

Water quality in the Shark River estuary, Everglades National Park, Florida, is strongly influenced by seasonal patterns of rainfall, water level, and temperature. During the rainy season (summer and early fall) the salinity in the 20-mile long estuary ranges from that of fresh water to half that of sea water while concentrations of dissolved oxygen are low, 2-5 milligrams per liter. During the dry season (late fall through spring) the salinity ranges from 18 grams per liter (g/l) in the headwaters to 36 g/l at the Gulf during a dry year such as 1967 and from 1 to 25 g/l during a wet year such as 1969. The patterns of distribution of planktonic and small nektonic animals in the estuary are related to salinity. The presence of large numbers of juvenile and young animals indicate the importance of these brackish waters as nursery grounds. Small fish and prawns, which concentrate in the headwaters as the water level dropped, serve as a rich source of food for predatory marine fish and birds. (Knapp-USGS)
W71-08329

SPARTINA 'DIE-BACK' IN LOUISIANA MARSHLANDS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 05C.
W71-08348

RECOVERY OF SALT MARSH IN BRITTANY SIXTEEN MONTHS AFTER HEAVY POLLUTION BY OIL,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
For primary bibliographic entry see Field 05C.
W71-08600

STUDIES OF THE NATURAL ALPHA-EMITTING RADIOISOTOPES IN MARINE ORGANISMS,
Washington, Univ., Seattle.
For primary bibliographic entry see Field 05C.
W71-08654

OBSERVATIONS ON THE SMALL-SCALE DISTRIBUTION OF ESTUARINE PHYTOPLANKTON,
Maine Univ., Walpole. Ira C. Darling Center for Research; and Maine Univ., Walpole. Dept. of Zoology.
For primary bibliographic entry see Field 05C.
W71-08677

STRATIFICATION AND MIXING IN COASTAL WATERS OF THE WESTERN GULF OF MAINE DURING SUMMER,
Woods Hole Oceanographic Institution, Mass.
Edward M. Hulburt.
Journal Fisheries Research Board of Canada, Vol 25, No 12, p 2609-2621, 1968. 6 fig, 8 ref. AEC Contract AT (30-1)-1918.

Descriptors: *Sea water, *Temperature, *Fog, *Stratification, *Mixing, Solar radiation, Gulfs, Tidal effects, Winds, Thermal stratification, Weather, Currents (Water), Maine.
Identifiers: *Gulf of Maine, Coastal waters, Bay of Fundy, Casco Bay (Maine).

The low temperatures (between 11C and 13C) of surface water along the western coast of the Gulf of Maine indicate an active vertical mixing of water layers associated with tidal currents. High temperatures of 17C cause a pronounced stratification of water. The high temperatures were observed during the prevalence of fogs allowing heating of water during clear periods and a reduced cooling at night. (Wilde-Wisconsin)
W71-08679

ECONOMIC FACTORS IN THE DEVELOPMENT OF A COASTAL ZONE,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 06B.
W71-08753

ESTUARIES -- AMERICA'S MOST VULNERABLE FRONTIERS,
National Wildlife Federation, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-08755

THE COASTAL RESOURCES MANAGEMENT PROGRAM OF TEXAS: A SUMMARY.
For primary bibliographic entry see Field 06E.
W71-08759

SEAWATER INTRUSION IN STRATIFIED ESTUARIES,
Norwegian Inst. for Water Research, Oslo (Norway).
Y. F. Oeztuerk.
Water Research, Vol 4, No 7, p 477-484, July 1970. 5 fig, 1 ref.

Descriptors: *Estuaries, *Flow measurements, *Mathematical models, *Saline water intrusion, Mathematics, Sea water, Water quality control, Reynolds number, Mixing, Saline water-freshwater interface, Velocity.
Identifiers: Seawater intrusion length measurement.

The intrusion of seawater into estuaries is caused by density differences between seaward flowing river-water and seawater. An understanding of estuary flow conditions is essential to solving estuarine problems. Mathematical models for determining seawater intrusion length are presented. Formulas for representing estuary parameters and length correction factor are derived with field data demonstrations. In real estuaries the estuary shape factor is essential in determining the seawater intrusion length. Another important factor is the Reynolds number for the river, which introduces the factor of transition from one type of flow to another for certain riverflow velocities. Observations are made showing the importance of these two factors in the general formulaization of seawater intrusion length. (McEntyre-PAI)
W71-08760

PHYSICAL DATA POTOMAC RIVER TIDAL SYSTEM INCLUDING MATHEMATICAL MODEL SEGMENTATION,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Support Lab.
Norbert A. Jaworski, and Leo J. Clark.
Technical Report No. 43, 50 p, 8 fig, 15 tab.

Descriptors: *Estuaries, *Water quality, *Physical properties, Measurement, Bridges, Buoys, Rivers, Water pollution control.
Identifiers: *Potomac River Estuary, Data interpretation aids.

The physical characteristics of the Potomac Estuary are systematically and accurately defined. Factors considered for these water quality studies included surface and cross sectional areas, volumes, and distances between bridges, buoys, landmarks and other reference points. These factors are necessary for interpretation of field survey information and mathematical model studies. (Ensign-PAI)
W71-08774

NUTRIENT MANAGEMENT IN THE POTOMAC ESTUARY,
Federal Water Quality Administration, Annapolis Md. Chesapeake Support Lab.
For primary bibliographic entry see Field 05C.
W71-08775

EXPERIENCES WITH OPERATING AN AUTOMATIC WATER QUALITY MONITORING SYSTEM IN AN ESTUARINE ENVIRONMENT,
Federal Water Quality Administration, Edison N.J. Hudson-Delaware Basins Office.
For primary bibliographic entry see Field 05A.
W71-08875

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES--PART 1: EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES,Quirk, Lawler and Matusky Engineers, New York.
Quirk, Lawler and Matusky Engineers, New York.
For primary bibliographic entry see Field 05G.
W71-08928

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

WATER RESOURCES IN THE UPPER STONE RIVER BASIN, CENTRAL TENNESSEE,
Geological Survey, Nashville, Tenn.
For primary bibliographic entry see Field 02F.
W71-08330

FIELD STUDIES OF THE INFILTRATION CAPACITY OF SOILS (RUSSIAN: POLEVYKH ISSLEDOVANIYAKH TYVAYUSHCHEY SPOSOBNOSTI POCHV GRUNTOV),
For primary bibliographic entry see Field 04A.
W71-08384

THE CALIFORNIA WATER PLAN,
Loughborough Univ. of Technology (England).
For primary bibliographic entry see Field 06B.
W71-08446

REDUCTION OF STREAMFLOW INCREASE FOLLOWING REGROWTH OF CLEARCUT HARDWOOD FORESTS,
Southeastern Forest Experiment Station, Asheville N.C.

yne T. Swank, and Junior D. Helvey.
nposium on the Results of Research on presentative and Experimental Basins, Welling-, (N.Z.), Pub No 96 AIHS, p 346-360, 1970. 7 3 tab, 14 ref.

criptors: *Water yield improvement, *Vegeta- effects, *Small watersheds, *Vegetation owth, *Clear-cutting, Deciduous forests, potranspiration, North Carolina, Consumptive Water supply.
ntifiers: Experimental watersheds, Coweeta drolic Laboratory.

mature hardwood forest on a 16-hectare hment at the Coweeta Hydrologic Laboratory North Carolina was initially clearcut in 1939. first year following cutting, streamflow in- sed 360 mm. As the even-aged coppice stand ew, annual streamflow increases approached reatment levels as a linear function of the rith of time: after 23 years, streamflow was still tly above pretreatment levels. The watershed clearcut again in 1962, and streamflow onse for the year following cutting was 380 In striking contrast to the first cutting, stream- increases have diminished at a much faster and it appears that annual water yield will rn to pretreatment levels after just 16 years of st regrowth following the second cutting. The rence in the measured watershed response is buted primarily to a more rapid recovery of tation in the second treatment period. The lts of another recent experiment on a rshed at Coweeta demonstrated that annual r increases obtained from clearcutting in the hern Appalachian forests can be more short- than previous experiments have indicated. -08838

AL SNOW COVER AND DISPOSITION OF WMELT RUNOFF IN CENTRAL ORADO,
ky Mountain Forest and Range Experiment on, Fort Collins, Colo.
les F. Leaf.
A Forest Serv Res Pap RM-66. 19 p, illus.

riptors: *Aerial photography, *Runoff, wmelt, Hydrologic data, *Snowpacks, Snow eys, *Runoff forecasting, *Streamflow asting, Hydrology, Small watersheds, *Water ice, *Rocky Mountain Region, Colorado, ther modification.
ifiers: *Rocky Mountains, Fraser Experimen- orest, Colorado, Water Resources Program.

l snow-cover depletion and resultant snowmelt water yield were studied on three small rsheds in the Fraser Experimental Forest. er water yield efficiencies were observed on watersheds which had: (1) almost complete cover when seasonal snowmelt rates on all r aspects were maximum; (2) a delayed and snow-cover depletion season; and (3) rate recharge and evapotranspiration losses. r yield efficiency in one watershed with low- tion south slopes was least. In 1969, stream- from the drainage area on this basin below feet was less than 30 percent of that ated from above this elevation. Fourteen of comparative streamflow indicated that yields from the low elevation subdrainage ary from near zero in poor runoff years to a num during good years of about 50 percent of low generated from the high elevation sub- age.
08844

JECT SKYWATER, PROCEEDINGS, SKY ER CONFERENCE II. DESIGN AND LUATION OF WEATHER MODIFICATION ERIMENTS.
u of Reclamation, Denver, Colo. Office of spheric Water Resources.

able from the National Technical Information ce as PB-196 197, $6.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation report REC-OCE-70-58, Oct 67. 357 p.

Descriptors: *Clouds, *Weather modification, *Cloud seeding, *Cloud physics, Nucleation, Silver iodide, Ice, *Artificial precipitation.
Identifiers: Cumulus clouds, Design convection, Computerized simulation, Skywater project.

The Bureau of Reclamation's Atmospheric Water Resources Program, Project Skywater, is developing the capability to apply precipitation management techniques to the solution of our nation's water needs. Evolutionary processes leading toward the best precipitation management system require the identification and analysis of the many problems in weather modification. The design and evaluation of weather modification experiments were presented at Skywater Conference II, and the importance of conducting field experiments in such a way that definitive answers to the posed questions can be given was stressed. Statisticians and experimental design people emphasized the need for allowing adequate time to obtain results. Their advice contained a caution that being in too great a hurry usually resulted in experimental failure, and that the more uncertainties involved in a particular experiment, the more the need for randomization. Experiments conducted in rugged terrain and under extreme weather conditions pose special problems. These problems added to the problems of adequate measurement of many parameters and new capabilities for measuring other parameters make the design of meaningful experiments extremely difficult.
W71-08870

PROJECT SKYWATER, PROCEEDINGS, SKYWATER CONFERENCE I PHYSICS AND CHEMISTRY OF NUCLEATION.
Bureau of Reclamation, Denver, Colo. Office of Atmospheric Water Resources.

Available from the National Technical Information Service as PB-196 196, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation report REG-OCE-70-57, July 1967. 419 p.

Descriptors: *Weather modification, *Cloud seeding, *Nucleation, *Cloud physics, *Artificial precipitation, Silver iodide, Meteoric water, Chemistry of precipitation.
Identifiers: *Cloud modification, Orographic precipitation, USBR Research Contracts, Skywater Project, Pyrotechnic.

The Bureau of Reclamation's Atmospheric Water Resources Program, Project Skywater, is developing the capability to apply precipitation management techniques to the solution of our nation's water needs. Evolutionary processes leading toward the best precipitation management system require the identification and analysis of the many problems in weather modification. Skywater Conference I reviews the physics and chemistry of nucleation and the state of knowledge of these processes, and points out the importance of continuing research in this area. A consensus indicated that effective nucleants now exist, but there is doubt that any material now in existence is ready to be made the basis of a large-scale operational precipitation management program. Nucleants must be tailored to cloud requirements, and a variety of nucleants used in sequence might be the eventual operational system. The need for alternatives to the use of large amounts of silver in an operational precipitation management program was stressed. (USBR)
W71-08871

EVALUATING WATERSHED MANAGEMENT ALTERNATIVES,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
For primary bibliographic entry see Field 04D.
W71-08915

3C. Use of Water of Impaired Quality

CONTENT OF ADENOSINE PHOSPHATE COMPOUNDS IN PEA ROOTS GROWN IN SALINE MEDIA,
Hebrew Univ., Jerusalem, (Israel). Dept. of Botany.
Edna Hasson-Porath, and Alexandra Poljakoff-Mayber.
Supported by a grant from the USDA (PL 480, A10-SWC-7; F9-IS-179). Plant Physiology, Vol 47, No 1, p 109-113, Jan 1971. 1 fig, 4 tab, 20 ref.

Descriptors: *Saline water, *Soil-water-plant relationships, *Phosphates, *Plant physiology, *Biochemistry, Sodium chloride, Sodium sulfate, Phosphorus compounds, Enzymes, Metabolism, Roots.
Identifiers: *Adenosine triphosphate, *Adenosine diphosphate, *Phosphorylation, *Phosphatases, *Nicotinic adenine dinucleotide, Mitochondria.

It is known that various metabolic pathways of pea plant (Pisum sativum) roots are altered when exposed to saline media. Attempts were made to determine whether changes are induced in adenosine phosphate levels in response to saline media. Both sodium chloride and sodium sulfate caused decreases of 60-70% in the ATP/ADP ratio in the root tissue when salinity was varied from 0-5 atm. Phosphatase and ATPase activity in soluble and mitochondrial fractions of sodium chloride-salinized plants were considerably higher than control levels, but were unaffected in sodium sulfate-salinized root mitochondria. Probably, then, oxidative phosphorylation is also directly affected by saline media. Salinity-induced mitochondrial phosphorylation depression was partially, but not completely reversed by the presence of NAD. Addition of sodium chloride to the reaction mixture did not affect phosphatase activity, but in some cases, sodium sulfate addition depressed it. (Casey-Arizona)
W71-08447

BRAK, A THREAT TO OUR IRRIGATION SCHEMES,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Soil Science.
M. Hensley.
South African Journal of Science, Vol 66, No 6, p 180-181, June 1970. 6 ref.

Descriptors: *Saline soils, *Alkaline soils, *Irrigation effects, *Leaching, Evapotranspiration, Calcium, Sodium.
Identifiers: *Leaching fraction, *Waterlogging.

Brak soils are alkaline, saline or saline/alkali soils. Brak is a chronic problem in irrigated lands. Usually the soil solution becomes 2-10 times more saline than the water by which it is irrigated. Salt concentration results from evapotranspirational water loss, and to prevent concentration, it is necessary to apply more irrigation water than that required to satisfy evapotranspirational demand. Once irrigation begins, soil salinity and exchangeable sodium should be carefully watched. Reclamation is through draining, leaching and replacement of exchangeable sodium by calcium. In South Africa, a brak survey of existing irrigation schemes and research on soil water movement are needed. It is necessary to be able to predict long term irrigation effects on each soil type and to integrate this into the planning of future irrigation schemes. (Casey-Arizona)
W71-08464

VEGETATION CHANGE FROM A SAND DUNE COMMUNITY TO A SALT MARSH AS RELATED TO SOIL CHARACTERS IN MARIUT DISTRICT, EGYPT,
Alexandria Univ. (Egypt). Dept. of Botany.
For primary bibliographic entry see Field 02I.
W71-08475

FURTHER STUDIES OF EUROTIA LANATA GERMINATION IN RESPONSE TO SALINITY,
Utah State Univ., Logan. Dept. of Range Science; and Utah State Univ., Logan. Ecology Center.
Lesley D. Clark, and Neil E. West.
Southwestern Naturalist, Vol 15, No 3, p 371-375, Feb 20, 1971. 2 tab, 7 ref.

Descriptors: *Saline soils, *Germination, *Halophytes, *Ecotypes, Seeds, Chlorides, Salts, Salt tolerance, Sulfates, Calcium, Potassium, Sodium, Sodium chloride, Utah.
Identifiers: *Seedlings.

An effort was made to determine whether winterfat (E. lanata) shows ecotypic variations within 1 valley. Seeds were collected at 3 sites in Curlew Valley, Utah: a pure bottom stand, a mixed bottom stand and mixed bench stand. The study employed a random block design with 4 replications at 4 levels of NaCl, Na carbonate, Ca chloride and K sulfate (0.0, 0.5, 1.0 and 2.0% solutions in 1.5% agar). All germination percentages decreased as salt level increased but differed significantly between salt levels and between seed sources for 3 of the salts. Chloride salts caused greater germination depression than sulfate salts. Annual germination differences are probably related to differences in seed source, production time and climatic differences. Nevertheless, the data suggests ecotypic differences between seeds from sites less than 1 mile apart. (Casey-Arizona)
W71-08481

POSSIBLE IMPROVEMENT OF ACID SULPHATE SOILS IN COASTAL AREAS OF ASIA BY MEANS OF SEA WATER LEACHING.
Economic Commission for Asia and the Far East, New York.

Water Resources Journal, United Nations Economic Commission for Asia and the Far East (ST/ECAFE/SER. C/87), p 81-82, Dec 1970. 2 p, 1 tab, 1 ref.

Descriptors: *Leaching, *Acidic soils, *Sea water, *Sulfates, *Land reclamation, Irrigation practices, Drainage, Reclamation, Soil chemistry, Water chemistry.
Identifiers: *Indonesia, *Indochinese Peninsula, *Acid-sulfate soils.

Acid sulphate soils are very widely distributed in the ECAFE region. Extensive areas are found along the coasts of Kalimantan in Indonesia. Some one million hectares are reported from the Mekong delta. Tests with an acid-sulphate soil sample from the San Francisco Bay area used the high-salt water dilution method for leaching and reclamation of sodic soils. Short columns of the soil were leached with various amounts of synthetic sea water and/or a five-fold dilution of sea water, followed by distilled water in each case, to determine changes effected in the pH and exchangeable-cation composition of the soil. The treatments applied and the results obtained are summarized. Leaching with sea water removes large amounts of Al, increases soil pH appreciably, and increases base saturation to some extent. The increases in base saturation result from increases in exchangeable Na and K, with the content of exchangeable Ca..Mg actually decreasing slightly. (Knapp-USGS)
W71-08545

WARM WATER UTILIZATION,
Oregon State Univ., Corvallis. Dept. of Soils.
L. Boersma.
Oregon State University, 1970. 49 p, 9 fig, 13 tab, 14 ref. OWRR Project B-009-ORE (1).

Descriptors: *Water reuse, *Heated water, *Energy, Thermal water, Heat transfer, Agriculture, Power plants, Industries, Waste treatment, Aquatic animals, Heat budget, Soils, Social value, Cost analysis, Monetary benefits, Energy conversion.
Identifiers: *Waste heat.

Utilization of thermal water resulting from power generating plants as a supply of energy is proposed. The potential uses include heating homes, greenhouses, animal enclosures, soils, fermented organic wastes, and cultures of water inhabiting organisms. To avoid a loss of the valuable resource, the water may be recycled in a closed system, routed through either a soil warming loop, or evaporative cooling coils. Detailed information is included on the relation of heat and soil temperature, extensive and intensive cooling systems, production of farm crops, fish and algal cultures, and cost analysis. (Wilde-Wisconsin)
W71-08671

REVIVING THE GREAT LAKES,
Chicago Univ., Ill. Center for Urban Studies.
For primary bibliographic entry see Field 05G.
W71-08822

3D. Conservation in Domestic and Municipal Use

CHARACTERISTICS OF HOUSEHOLD WATER CONSUMPTION IN THREE NEW HAMPSHIRE COMMUNITIES,
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 06D.
W71-08323

METROPOLITAN WATER MANAGEMENT: CASE STUDIES AND NATIONAL POLICY IMPLICATIONS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06B.
W71-08516

3E. Conservation in Industry

A CASE HISTORY IN FOOD PLANT WASTE WATER CONSERVATION AND PRETREATMENT EXPERIENCE,
Artichoke Industries, Inc., Castroville, Calif.
For primary bibliographic entry see Field 05D.
W71-08420

3F. Conservation in Agriculture

WATER RESOURCES OF EAST BIHAR RIVERS,
Bihar State Irrigation Commission, Patna (India).
For primary bibliographic entry see Field 02E.
W71-08342

A DEVICE FOR MEASURING RUNOFF FROM CROP ROTATION FIELDS (RUSSIAN: USTROYSTVO DLYA IZMERENIYA STOKA VODY NA POLYAKH SEVOOBOROTA),
For primary bibliographic entry see Field 04A.
W71-08387

A STUDY OF THE EFFECTS OF INSTITUTIONS ON THE DISTRIBUTION AND USE OF WATER FOR IRRIGATION IN THE LOWER RIO GRANDE BASIN,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 06B.
W71-08395

FIRST NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES PROCEEDINGS.
For primary bibliographic entry see Field 05D.
W71-08398

ANIMAL FEEDS FROM VEGETABLE WASTES
Agricultural Research Service, Albany, Cali
Western Utilization Research and Developmen
Div.
For primary bibliographic entry see Field 05D.
W71-08421

ANCIENT TECHNOLOGY AND MODER SCIENCE APPLIED TO DESERT AGRICUL TURE,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany
L. Shanan, M. Evenari, and N. H. Tadmor.
Supported by the Rockefeller Foundation and th
Edmond and James de Rothschild Memorial Fun
Endeavor, Vol 28, No 104, p 68-72, May 1969.
fig, 1 tab, 3 ref.

Descriptors: *Runoff, *Water control, *Arid land
*Irrigation efficiency, *Flood irrigation, Irrigati
engineering, Drainage basins, Terracing, Histo
Loess, Soil types, Watershed management, Deser
Crop response, Alfalfa, Grains, Drought resistanc
Foreign lands, Photogrammetry, Water distributi
(Applied), Watersheds (Basins).
Identifiers: *Negev Desert, *Runoff agricultu
*Microcatchments.

From 1957-1962 about 10,000 ha. were intensiv
surveyed in the Negev Desert of Israel in order
elucidate the irrigation farming techniques of s
cessful ancient agricultural civilizations. Two pr
cipal methods of 'runoff agriculture' recogni
were: farm units based on small watersheds and v
ley units based on large watersheds. Intricate wa
distribution systems, utilizing highly sophistica
irrigation engineering techniques, ensured
flood control. In order to test the validity of th
conclusions, 2 typical ancient farms were rec
structed and farmed almost exactly as the ancie
had. Over the past decade, these experime
farms have yielded a number of valuable resu
(1) In even the most extreme drought years, at l
1 flood supplied enough irrigation water to sus
the agriculture; (2) the efficiency
microcatchments (up to 0.1 ha. in area) in aver
annual water harvest were 20-30 times greater t
large wadis; (3) slopes of 2-3% gave the hig
water yields, which could be increased by clea
them of stones; (4) a large variety of crops coul
grown, and proved more drought-resistant than
merly thought, indicating that irrigated crop
general are overwatered. (Casey-Arizona)
W71-08444

CONTENT OF ADENOSINE PHOSPHA COMPOUNDS IN PEA ROOTS GROWN SALINE MEDIA,
Hebrew Univ., Jerusalem, (Israel). Dept.
Botany.
For primary bibliographic entry see Field 03C.
W71-08447

LAND UTILIZATION IN NONIRRIGA AREAS,
Food and Agriculture Organization of the U
Nations, Rome (Italy). Crop and Gras
Production Service.
Roald A. Peterson.
Presented at an international conference,
Lands in a Changing World', Tucson, Ari
June 1969. In: Arid Lands in Transition, Dreg
E (ed), Pub No 90, AAAS, p 435-449, 1970. 4

Descriptors: *Arid lands, *Semiarid clim
*Land management, *Grazing, *Dry farming,
use, Water resources, Social aspects, Legal as
Economic feasibility, Ecosystems, Increment
come, Multiple purpose, Environmental ef
Productivity.
Identifiers: *Population pressures.

The major form of land utilization in most ar
gions is animal production through grazing.
lation increases in most arid lands imply tha
social and resource utilization factors mu
revised. Arid zones present several unique f

t render their development difficult: (1) Intensi-
of use is low in comparison with more favored re-
ns, and misguided attempts at overintensifica-
n more quickly lead to environmental degrada-
n; (2) Capital inputs yield relatively low incre-
nts in production, thereby discouraging inflow
new capital; (3) Intensification must be horizon-
rather than vertical, owing to limited absorptive
acity; (4) Land uses have been poorly in-
rated and multiple usage has been limited; (5)
st countries with arid zones have been reluctant
invest in research and development, preferring
re intensive exploitation of their humid regions.
umber of detailed suggestions are advanced, in-
ving institutional mechanisms, resource evalua-
, education, research, institutional reorganiza-
, capital incentives and water development.
sey-Arizona)
1-08453

RICULTURAL DEVELOPMENT IN INDIA,
ian Council of Agricultural Research, New
hi (India).
. Kanwar.
sented at an international conference 'Arid
ds in a Changing World', Tucson, Arizona,
e 1969. In: Arid Lands in Transition, Dregne, H
d), Pub No 90, AAAS, p 451-470, 1970. 6 fig,
f.

criptors: *Arid lands, *Water resources
elopment, *Research and development, *Land
Productivity, Crop response, Corn (Field),
eat, Livestock, Groundwater, Soil types, Soil
cture, Desalination, Wells, Irrigation practices,
er yield improvement, Education, Pest control.
tifiers: *India, *Developing countries, *Green
olution, *Central Arid Zone Research Institute,
ordinated research.

nderdeveloped countries such as India, the
ority of the population is employed in relatively
icient agriculture. The need to raise per capita
luctivity is great, and agricultural intensifica-
must be vertical, since there are few remaining
xploited lands. The organization and goals of
Indian Council of Agricultural Research and
Central Arid Zone Research Institute are
ribed. Indian research experience indicates
coordinated research projects, concentrating
single problem category, are extremely suc-
ful. Crop improvement projects funded by
erican foundations and universities have been
uccessful that they have led to the 'green
olution'. In the arid zone, crop varieties have
developed that mature during the short rainy
on. Groundwater surveys, tube well construc-
and desalination research combined with soil
es and new irrigation methods are increasing
agriculture in the arid zone. However, great
hasis is also being placed upon water use effi-
cy which is leading to increased crop intensifi-
n. Agricultural education methods are also in-
fying. The Indian approach to agricultural
nology transformation is a massive effort.
ey-Arizona)
-08454

ICAN EXPERIENCE,
ela Nacional de Agricultura, Chapingo (Mex-
Dept. of Botany.
m Hernandez Xolocotzi.
nted at an international conference, 'Arid
s in a Changing World'. In: Arid Lands in
sition, Dregne, H E (ed), Pub No 90, AAAS, p
343, 1970. 7 fig, 8 tab, 25 ref.

riptors: *Irrigation, *Dry farming, *Arid
, *Mexico, *Livestock, Vegetation, Crops,
use, Land tenure, Legal aspects, Social
cts, Xerophytes, Shrubs, Research and
lopment, Research facilities, Goats, Fiber
, Social impact, Watersheds (Divides),
gn lands, Irrigation practices, Salinity,
arid climates, Ecology, Ecosystems, Wind ero-

ifiers: *Overgrazing, *Population pressures.

Mexico has a prolonged empirical precolonial backlog of utilization of extremely limited arid lands resources. The introduction of metal tools, cultivation and domestic livestock by the Spaniards widened exploitation of the arid zone. Initial ecological studies indicate that even in areas of small human populations, native wildlife and native vegetation have been drastically reduced, less productive wood plants have greatly extended their ranges, and wind erosion is widespread. However, intensive developments and improvements have also occurred. The arid zone states of the northeast and northwest have experienced massive irrigation development problems and with this have come widespread usage of fertilizers, mechanized equipment, crop diversification, extension services and agricultural research facilities. Other, less favored areas, have not been as extensively developed but are recipients of the advantages of a national commitment to agricultural research. Many projects are described: improvement of livestock forage, irrigation salinity, improved crop stocks, native plant utilization, goats, fertilizer experiments and crop gene banks. (Casey-Arizona)
W71-08455

NORTH AFRICA: PAST, PRESENT, FUTURE,
Food and Agriculture Organization of the United Nations, Rome (Italy). Plant Production and Protection Division.
H. N. Le Houerou.
First part of a paper presented at an international conference, 'Arid Lands in a Changing World', Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 227-278, 1970. 36 fig, 11 tab, 65 ref.

Descriptors: *Social aspects, *Arid lands, *Regional analysis, *Ecology, *Water resources, Vegetation effects, History, Human population, Human pathology, Grazing, Farming, Land resources, Productivity, Soil conservation, Water conservation, Salinity, Irrigation practices, Livestock, Social impact.
Identifiers: *North Africa, *Population pressures, *Desertification, *Potential evapotranspiration, *Land degradation.

The 4 countries of North Africa (Morocco, Algeria, Tunisia and Libya) share a common history and many similarities in both natural conditions and human populations. The various climates, soils, physiographies, vegetation and water resources of the area are described in detail and bioclimatological maps are presented. For over 12 centuries, the history of these regions has been characterized by endless warfare between nomadic and sedentary populations, which together with famines and epidemics, established an equilibrium between agricultural productivity and human population. The colonial conquests of the 19th and 20th centuries broke this equilibrium by establishing peace and introducing modern hygiene and medicine. The resulting population pressures have intensified forest degradation, water resource exploitation and soil erosion. Desertification, because of population pressures and bad agricultural practices, proceeds at the rate of 100,000 ha/yr. Some soil and water conservation methods are suggested. (Casey-Arizona)
W71-08457

DESERTS OF ASIA,
Leningrad State Univ. (USSR). Dept. of Geography.
M. P. Petrov.
Presented at an international conference, 'Arid Lands in a Changing World', Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 279-302, 1970. 12 fig, 14 ref.

Descriptors: *Agriculture, *Deserts, *Water resources, *Mineral industry, *Oil industry, Industrial production, Biomass, Productivity, Groundwater, Diversion, Irrigation programs, Social aspects, Grazing, Solar radiation, Rainfall, Desalination, Surface waters, Transportation, Greenhouses.
Identifiers: *Thar Desert, *Central Asia, *Middle East.

Desert resources include 3 main aspects: biological productivity, water and mineral resources and solar and wind energy. Although biological turnover is rapid, biomass reserves are small, and the low biological productivity places severe limits on animal husbandry. When water resources are combined with solar radiation (irrigation), productivity may leap sharply. Much attention has been paid to subsurface water exploitation and it appears that such reserves are much higher in Asian deserts than formerly thought. In contrast to biological productivity, mineral resources of the deserts (oil, gas, metals, etc.) possess very high economic potential and stability. Through modern technological developments, and better transportation networks, the exploitation of Asian deserts is currently proceeding on a massive scale, particularly in the USSR. This is leading not only to agricultural and industrial changes but also to social changes. The development in the deserts of Soviet Central Asia of large water diversion and irrigation projects, resource exploration, grazing, mineral deposits, water resources, industry and transportation are described in detail. Developments in Chinese central Asia, the Middle East and the Thar Desert of India are also briefly discussed. Many aspects of modern technology such as pipeline construction, mining, desalination and desert hothouse agriculture are considered extremely promising, and arid land exploitation will probably continue to increase in the foreseeable future. (Casey-Arizona)
W71-08458

GEOGRAPHIC CONSIDERATIONS IN PLANS FOR DEVELOPMENT,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
David H. K. Amiran.
Presented at an international conference, 'Arid Lands in a Changing World', Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 89-103, 1970. 4 fig, 5 ref.

Descriptors: *Arid lands, *Geographical regions, *Irrigation practices, *Social aspects, *Economic feasibility, Semiarid climates, Tourism, Speciality crops, Regional analysis, Desalination, Technical feasibility.
Identifiers: *Developing nations, *Technical assistance.

In arid zones, the realities of water scarcity and soil conditions rule out the practices of traditional agriculture or pastoralism by large populations. Large-scale irrigation projects are ruled out as major developmental factors in most arid regions. Irrigation is a form of advanced regional development which therefore requires an elaborate regional infrastructure of transportation, powerlines and social services. However, the typical discontinuous distributions of arid land settlement patterns to restricted areas of intensive occupance separated by wide unoccupied areas renders such infrastructural economics unrealistic. Additionally, high evaporative demand lowers the yield efficiency per unit of irrigation water, making initial investment costs extremely high. Desalinization will not be a panacea for arid lands either, even in coastal deserts. It is felt that 2 types of industry are most realistic for arid lands: (1) Tourism, (2) Off-season agriculture producing specialty crops for out-of-region markets, that command high unit prices. The major difficulties involving arid zone technical assistance are the requirements of risk capital which is usually more realistically commanded in other areas and the problem of transferability of technical assistance between populations at different levels of technological and managerial competence and between different climatic environments. (Casey-Arizona)
W71-08459

PRODUCTIVITY OF ARID AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Rangelands Research Unit.
R. A. Perry.
Presented at an international conference 'Arid Lands in a Changing World', Tucson, Arizona, 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 303-316, 1970. 5 fig, 2 ref.

Descriptors: *Arid lands, *Productivity, *Land use, *Water resources, *Grazing, Sheep, Cattle, History, Land management, Land tenure, Vegetation effects, Economic feasibility, Transportation, Social aspects, Soil erosion, Soil types, Foreign lands, Political aspects, Environmental effects, Geographical regions, Mining.
Identifiers: *Australia.

Australia contains the largest desert land area of any country in the world. Nevertheless, 97% of her 12 million people live in the relatively fertile, highly industrialized coastal 'boomerang' of the southeast. Further the coastal 'boomerang' is largely independent of the arid zone, producing enough food and fiber for its needs, while still having reserve space and resources for greatly expanded production. In a sense, then, the arid zone is a uniquely giant appendage to the coastal strip, and this has resulted the allocation of very few national resources for its development. The arid zone receives most of its rainfall in the summer, and as in all arid regions it is highly erratic. In other respects, it is singular. It is traversed by no high climate affecting mountain ranges or any permanent exogenous rivers. Soils are thin and infertile and there are no spiny or succulent plants. Indigenous perennials are of fairly low nutrient values, the best forage being annuals that occur only in rainy years. Most stock water supplies must be man-made and represent relatively high capital investments. Because of high transportation costs, only sheep and cattle may be economically raised. On the credit side, pests and diseases are minimal. Social problems are engendered by the vast land area, and medical, educational and cultural services are difficult to provide. The history, economics and land tenure system of the area are reviewed. Overexploitation and neglect are reducing the already low productivity of many areas, and the author feels that the nation is committing a serious error in its indifference to the problems of the arid region. (Casey-Arizona)
W71-08460

PUBLIC ACTION: REQUISITE FOR SUCCESS,
For primary bibliographic entry see Field 06B.
W71-08461

LAND USE ECOLOGY AS A THEME IN BIOGEOGRAPHY,
Durham Univ. (England). Dept. of Geography.
I. G. Simmons.
Canadian Geographer, Vol 14, No 4, p 309-322, Winter 1970. 2 tab, 37 ref.

Descriptors: *Biogeography, *Ecosystems, *Land use, *Productivity, *Biological communities, Agriculture, Grazing, Forestry, Food chains, Food webs, Biomass, Watersheds, Xerophytes, Trophic level, Energy conversion, Water conservation, Ecological distribution, Environmental effects, Mode of action.

In reviewing land use systems, ecosystems are looked at from the human standpoint. The dimension of human culture is important because many resource processes which are ecologically possible are culturally unacceptable. Ecosystems are considered as layered trophic levels, characterized at each level by taxonomic and numerical diversity. Biogeochemical cycling through levels may be represented by food chains or food webs, and stability is related to organismic diversity, since the buffering capacity to change in the ecosystem increases with numbers of species. Human activities usually affect ecosystem simplification by decreasing species diversity and energy pathways. An extreme case is modern agricultural monoculture such as cornfields, where stability is maintained by high inputs of matter and energy. Man may also affect systems by altering their critical limits. Land set aside for recreation or conservation is usually the least affected, and only esthetic satisfaction is gained. In water catchment areas, although localized changes may occur from terrestrial to aquatic systems, the watershed itself is little affected. Grazing is the extensive pastoralism of a selected domesticate, with all other herbivores considered pests. Badly controlled grazing often creates tremendous changes in ecosystems, such as the invasion of semiarid grasslands by xerophytic shrubs. Two critical limiting factors are herbivore conversion efficiency and herbivore selectivity. Forest is a sort of grazing operation which often leads to soil erosion and river silting. Shifting agriculture is most practiced in the tropics and involves interference with the rapid mineral cycling by the native vegetation, and quick depletion of soil minerals. Sedentary agriculture is mainly monocultural and decreases productivity but increases man's crop. (Casey-Arizona)
W71-08462

THE EFFECT OF WATER STRESS ON INDOLEACETIC ACID OXIDASE IN PEA PLANTS,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 02I.
W71-08463

BRAK, A THREAT TO OUR IRRIGATION SCHEMES,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Soil Science.
For primary bibliographic entry see Field 03C.
W71-08464

NOTE ON HYDROLOGICAL RESEARCH IN BOTSWANA WITH SPECIAL EMPHASIS ON RESEARCH IN THE HYDROGEOLOGICAL FIELD,
Botswana Geological Survey, Lobatse.
For primary bibliographic entry see Field 04B.
W71-08467

THE EFFECTS OF ANTITRANSPIRANT CHEMICALS ON THE TRANSPIRATION AND PHYSIOLOGY OF TAMARIX SPECIES,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02D.
W71-08469

LIVESTOCK PRODUCTION IN THE SUBTROPICAL AND TROPICAL AFRICAN COUNTRIES,
Pretoria Univ. (South Africa). Dept. of Animal Science.
Jan C. Bonsma.
South African Journal of Science, Vol 66, No 5, p 169-172, May 1970. 4 ref.

Descriptors: Livestock, *Environmental effects, *Rainfall, *Tropical regions, *Productivity, Savannas, Semiarid climates, Phosphorus, Iron, Nitrogen, Calcium, Hydrogen ion concentration, Humid areas, Nutrients, Ecology, Growth rates, Management, Subtropic, Grasses.
Identifiers: *Hyperthermy, *Performance testing, *Adaptability.

The tropical and subtropical regions contain about 2/3 of the world's livestock numbers, but produce only about 10% of the world's edible livestock products. More attention must be given to the interaction between environment and animals, and this is illustrated by the differences between semiarid regions (savannas) and humid regions. In the low rainfall savannas, soil pH is usually near 7.0 and Ca, P and N levels are adequate. Most grasses are high in protein and palatable during winter months. In the humid regions, soil nutrients are leached out by the high rainfall and the grasses are highly fibrous with high heat increment values. Hyperthermy therefore becomes a critical problem and well adapted animals must be utilized. Small animals with high surface area/volume ratios dissipate heat more quickly. In all areas, the 2 most important measures of adaptability are fertility and weight gain. (Casey-Arizona)
W71-08472

NITROGEN IN AGRICULTURE: THE PROBLEMS AND THE EFFECT ON THE ENVIRONMENT,
Edinburgh Univ. (Scotland).
Stephen Watson.
Advancement of Science, Vol 27, No 131, p 25-37, Sept 1970. 5 fig, 5 tab, 15 ref.

Descriptors: *Nitrogen, *Water pollution effects, *Land management, *Environmental effects, *Fertilizers, Ammonia, Nitrates, Ureas, Nitrogen fixation, Crop response, Nitrogen fixing bacteria, Nitrogen cycle, Legumes, Grasses, Proteins, Soil microorganisms, Sewage, Farm wastes.

About 80% of the world's human population utilizes only 20% of the world's available protein. The problem is not one of redistribution but of increasing protein supplies. World supplies of fixed N are divided into 60 million tons in animals, 1000 million in plants and 150,000 million in the soil. To this, 100 million tons are annually added by biological fixation and 10 million by industrial fixation. The production of N by soil microorganisms and the utilization of N by plants are reviewed in detail. The problem of proper pasture mixtures between grasses and legumes in combination with controlled grazing is considered and the phenomenon of increased N fertilizer application to grasslands is described. Combinations of legumes and grasses result in improved pastures and soil fertility but the process is too slow to rule out N fertilizer applications in combination with appropriate water applications. Field drying is a brittle process which may result in great protein loss unless carefully managed, particularly because of the high cost of evaporating water. The problem of water pollution due to increased N fertilizer application and intensified cattle feeding is considered in detail. Such pollution may be considerable, but will not be of the same order as that due to biological fixation, town sewage and industrial wastes. (Casey-Arizona)
W71-08478

SOME PHYSICAL ASPECTS OF WATER RESOURCE DEVELOPMENT IN TANZANIA,
University Coll., Dar-es-Salaam (Tanzania). Dept. of Geography.
For primary bibliographic entry see Field 02D.
W71-08483

SEMIAUTOMATIC IRRIGATION.
Colorado State Univ., Fort Collins.

Colorado Farm and Home Research, Vol 19, No. July-Sept 1969, p 5, 1 fig.

Descriptors: *Irrigation systems, *Irrigation practices, *Irrigation efficiency, *Irrigation operation and maintenance, *Water management (Applied), Instrumentation, Timing, Automatic control, Crop production, Hay, Turf, Labor, Costs, Check structures, Diversion, Water utilization, Plant growth regulators, Soil-water-plant relationships.
Identifiers: *Intermittent irrigation.

A semiautomatic irrigation system is described consisting of a timer (cost $8.50), wire and lumber. Intermittent irrigation improves hay yields and composition. The semiautomatic system is designed to reduce labor costs for intermittent

gation. The system reduces labor time from a day
o 30 minutes. Drop-open or drop-close check
ates are set in series to operate at predetermined
tervals. Water may be diverted or permitted to
ow to fields. The 24-hour time can be set to 13
ates for 2-hour irrigations. Water-use efficiency
ill increase under this system. A photograph
ows an operator adjusting the timer. (Popkin-
rizona)
71-08484

HE EFFECT OF CROPPING SYSTEMS, FAL-OW METHOD AND FERTILIZERS ON CROP IELDS AND SOIL PROPERTIES OF OUTHEASTERN COLORADO SOILS,
olorado Agricultural Experiment Station, Fort
ollins.
G. Brengle, H. O. Mann, and Robert S. Whitney.
olorado State University Experiment Station, Bul-
in 536-S, January 1969. 22 p, 15 tab, 1 fig, 8 ref.

escriptors: *Fallowing, *Fertilizers, *Plant
owth regulators, *Crop production, *Cultivation,
op response, Soil properties, Rainfall, Evapora-
n, Limiting factors, Solar radiation, Wind
locity, Distribution, Humidity, Soil-water-plant
ationships, Experimental farms, Lysimeters, Soil
atment, Data collections, Sorghum, Wheat,
nd erosion, Soil stability, Soil chemistry, Weed
ntrol, Colorado.
entifiers: *Cropping systems, Colorado Branch
periment Station, Semi-arid lands.

op production is limited in Southeastern
olorado by an average annual rainfall of about 15
hes, average annual open-water-surface
aporation of about 78 inches, and variations in
aporation and rainfall distribution. High radia-
n and wind velocity, and low relative humidity
or evaporation. Conditions which affect soil-
ter-plant relationships were investigated at the
utheastern Colorado Branch Experiment Station
m 1956 to 1966 using a split-plot and subdivided
imeter. Treatments included fallowing, various
opping systems and fertilization; soil, plant and
ter sampled and analyzed. Grain sorghum
oduction was more stable than wheat. Wind
odibility, mechanical stability of soils, soil
emistry, and effects of continuous sorghum are
cussed. The areal soils are highly erodible re-
dless of cropping, fallowing, tillage or fertiliza-
n regime. Mechanical and chemical weed con-
l was satsifactory. Tables show effects of various
atments on soil properties, crop yields, and in-
ne generated. Data on precipitation and
poration are presented. (Popkin-Arizona)
1-08485

RINKLER IRRIGATION SYSTEM PLUS FER-LIZER EQUALS FERTIGATION,
th Dakota State Univ., Brookings. Dept. of
ricultural Engineering; and Water Resources
., Brookings, S. D.
n L. Wiersma.
th Dakota Farm and Home Research, Vol 20,
1, Winter 1969, p 5-8. 7 fig.

criptors: *Water conservation, *Sprinkler ir-
tion, *Irrigation systems, *Water management
plied), *Fertilization, Irrigation efficiency,
rogen, Trace elements, Pressure head, South
kota, Corrosion control, Safety factors, Pumps,
omatic control, Depth, Nutrients, Leaching.
ntifiers: *Fertigation, Compressed air, Liquid
ilizer.

igation is the use of sprinkler irrigation systems
method of applying fertilizers. Nitrogen and
e elements may be applied this way, with nu-
ous types, methods and equipment. Pressure
ems are limited by injection method and
orm-application demands. A constant low
id volume is injected into the system according
method developed by the Agricultural Experi-
nt Station and Water Resources Institute at
th Dakota University. Compressed air is in-
ed into a liquid fertilizer tank, forcing the fertil-
izer through an orifice under constant head and minimum corrosion impact. A pivot maintains 75 pounds per square inch, and is controlled by a regular shop-type air compressor. Safety devices (check valves) operate if the compressor fails, and the pump continues, or the pump stops. The automated system was tested on a 140-acre lot, injecting 870 gallons of anhydrous ammonia in 70 hours. The safety features worked, and the method gave an accurate, economical fertilization. Advantages include slight labor costs, use on tall crops, good surface distribution and depth placement, availability of solution nutrients, ease of leaching, and lower fertilizer requirement. Figures show schematic of air injection fertigator, control system and connections, safety features, and use. (Popkin-Arizona)
W71-08486

RETURNS FROM BEEF ON IRRIGATED PASTURES VS. RETURNS WITH OTHER CROPS,
Economic Research Service, Washington, D. C. Farm Production Economics Div; and Agricultural Research Service, Brookings, S. D.
C. C. Micheel, J. T. Nichols, J. R. Johnson, F. W. Whetzel, and C. J. Erickson.
South Dakota Farm and Home Research, Vol 20, No 1, Winter 1969, p 12-13. 4 tab. Part of project SWC W21-dNL-6,ARS and SDSU.

Descriptors: *Cattle, *Benefits, *Crop production, *Return (Monetary), *Comparative productivity, Water conservation, Water utilization, Irrigated land, Pasture management, Forages, Grasses, Alfalfa, Bromegrass, Orchard grass, Hay, Corn (Field), South Dakota.
Identifiers: *Beef production, Belle Fourche Irrigation Project (South Dakota).

Irrigated pastures provide important forages for beef. Expected returns for irrigated pastures are compared with returns of other crops for a 1965-67 study in the Belle Fourche Irrigation Project (South Dakota). Irrigated pastures consisted of a mixed alfalfa, brome and orchard grass. Other crops were corn and hay. Corn, hay and irrigated-pasture returns on 500-pound steers were comparable, though irrigated crops were not shown to be superior to other crops. Four tables show average beef production, costs and returns on irrigated pasture, irrigated crop, irrigated alfalfa-brome and break-even returns from beef on irrigated pasture. (Popkin-Arizona)
W71-08488

RANGE SITE SOURCES FOR LIVESTOCK WATER,
Department of Agriculture, Newell, S. D. Irrigation and Dry Land Field Station.
Armine R. Kuhlman.
Supported by US Department of Agriculture and South Dakota Agricultural Experiment Station.
South Dakota Farm and Home Research, Vol 20, No 1, Winter 1969, p 13-17. 6 fig.

Descriptors: *Livestock, *Range management, *Surface runoff, *Ponding, *Rainfall-runoff relationships, Consumptive use, Water supply, Economic efficiency, South Dakota, Sands, Loam, Forages, Watershed management, Experimental farms, Dikes, Flumes, Precipitation (Atmospheric), Seasonal, Variability, Snowmelt, Water storage, Seepage, Controlled drainage, Evaporation, Water loss, Clays, Water yield improvement, Water conservation.
Identifiers: *Panspots, *Solonetz soils, Containers.

Surface runoff, stored in ponds, is an economical water source on South Dakota livestock ranges. Range sites are of two types: panspots, on solonetz soils, where livestock find accumulated water; and sandy range sites, on normal coarse-to-fine sandy loams, where good forage production is possible. Two range site watersheds of 43 acres were investigated as experimental areas from 1962 to 1967. Confining dikes directed runoff to discharge-measurement flumes. Over 16 times as much livestock water came from panspots, where runoff occurred more frequently for the same precipitation. Seasonal variations, snow melt, and vegetative aspects are discussed. Water storage problems may be solved with ponding on panspot sites to reduce seepage. Watershed configuration controls runoff transmission and water loss. Livestock water needs may be met with ponding on heavy clay soils and with partially sealed containers. Six figures show a measuring flume, snow accumulation, and graphs of potential water supply, snowmelt and rainfall yield, and runoff variation. (Popkin-Arizona)
W71-08489

RESEARCH RELATES WEATHER TO NEBRASKA WATER USE,
Nebraska Univ., Lincoln. Dept. of Horticulture and Forestry.
For primary bibliographic entry see Field 02D.
W71-08490

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION: FIRST ANNUAL REPORT OF THE MALONEY CANYON PROJECT,
California Univ., Riverside. Dept. of Agronomy.
For primary bibliographic entry see Field 06G.
W71-08491

INCREASING SPRINKLING EFFECTIVENESS (RUSSIAN: SPOSOB POVYSHENIYA EFFEKTIVNOSTI DOZHDEVANIYA),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Selskokhozyaistvennogo Mashinostroeniya, Moscow (USSR).
B. M. Lebedev, I. K. Makarets, B. A. Voronyuk, O. E. Frey and G. P. Lyampert.
Gidrotekhnika i Melioratsiya, No 1, p 48-52, Jan 1971. 5 p, 3 fig, 8 tab.

Descriptors: *Sprinkler irrigation, *Wetting, *Crop production, *Runoff, *Soils, Water delivery, Chiselling, Fertility, Permeability, Irrigation water, Sprinkling, Equipment.
Identifiers: *USSR, Chisels.

Runoff of rain water and uneven wetting of soil lead to irregular ripening of plants and to a decrease in crop yield. Runoff and low permeability of soils have an adverse effect on sprinkler effectiveness, since the position of a sprinkler must be changed when runoff begins. One of the means of reducing runoff, erosion and the uneven wetting of soil during sprinkler irrigation is to create small ridges on the soil surface at the time of sowing, inter-row cultivation, and water-supply irrigation of fall-plowed fields, and to use chisels on hayfields and pastures. Small machine-made ridges on the surface of a field and chiselling will make it possible to utilize sprinklers more effectively, prevent runoff and erosion, provide more uniform soil wetting, and contribute to higher crop yield. (Josefson-USGS)
W71-08583

IRRIGATION PRACTICES AND IRRIGATION EROSION OF SOILS, (RUSSIAN: TEKHNIKA POLIVA I IRRIGATSIONNAYA EROZIYA POCHV),
Kh. Kh. Khamadamov, and I. Berdikulov.
Gidrotekhnika i Melioratsiya, No 1, p 59-61, Jan 1971. 3 p, 4 tab.

Descriptors: *Irrigation practices, *Furrow irrigation, *Irrigation water, *Erosion control, *Slopes, Rates of application, Topography, Nutrients, Fertility, Return flow, Soils, Particle size.
Identifiers: *USSR, Uzbek SSR, Samarkand Oblast, Irrigation erosion, Nutrient losses.

Studies conducted in the Payaryksiy Rayon of the Samarkand Oblast for irrigation-erosion control reveal a clear correlation between relief and irrigation water: the steeper the slope of an irrigation plot the more severe the irrigation erosion. In areas

with flat slopes (0.001-0.005) irrigation erosion is negligible regardless of the amount of irrigation water applied to a furrow. The extent of erosion and transport of soil particles beyond the area is 8-10 times less than in areas with steep slopes (0.01-0.05). Irrigation erosion leads to loss of humus, nitrogen, and phosphorus from the soil and to reduced soil fertility. Application of excess irrigation water results in loss of soil clay fractions, thereby contributing to coarser particle-size composition of the soils. To prevent slopes from exceeding 0.002-0.01, contour furrowing is needed to control erosion in areas with steep slopes. (Josefson-USGS)
W71-08585

ENVIRONMENTAL PROTECTION--TVA EXPERIENCE,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 06G.
W71-08640

THE V I LENIN KARAKUM CANAL IN THE TURKMEN SSR,
K. F. Efremov, O. S. Lavronenko, and M. M. Sarkisov.
Hydrotechnical Constr, No 4, p 346-350, Apr 1970. 5 p, 1 fig.

Descriptors: *Canal construction, Canals, Canal seepage, Climate, Arid climates, Economics, Arid lands, Industrial water, Foreign construction, Irrigation systems, *Irrigation, Irrigable land, Investment, Reservoirs, Agriculture, *Water supply, Regime, Reclamation, Land reclamation.
Identifiers: Karakum Canal, USSR, Industrial development, USSR.

The V I Lenin Karakum Canal, 840-km long, carries the waters of the Amu Dar'ya River to Ashkhabad, the capital of Turkmen SSR. The Karakum Canal transports water to the dry regions of the Republic, the Murgab and Tedzhen Oases, the Kopet-Dag area, and western and southwestern regions. In its present state of completion, the canal provides irrigation for 240,000 ha of new lands. Of all the Union Republics, the area served has the sparsest water resources. Water was insufficient for irrigation, and centers of population did not have adequate supplies. Otherwise, conditions were favorable for agricultural development. In the Karakum Canal area, collective farms have been or are being set up and reclamation of new lands is being accomplished. On lands presently irrigated, reconstruction of irrigation systems is planned. The Regional Plan of Turkmen SSR shows that the cost of the V I Lenin Karakum Canal, taking into account expenditures for land improvement, organizing collective farms, and the outlay by the government for developing industry adapted to production on land irrigated from the canal, was fully returned to the government by 1964, and a profit of 615 million rubles was produced by 1969. (USBR)
W71-08645

ECONOMIC ANALYSIS OF IRRIGATION IN SUBHUMID CLIMATE,
Montana State Univ., Bozeman. Dept. of Agricultural Economics.
Oscar R. Burt, and M. S. Stauber.
American Journal of Agricultural Economics, Vol 53, No 1, p 33-46, Feb 1971. 5 tables, 2 figures, 21 references.

Descriptors: *Irrigation programs, *Decision-making, *Economic efficiency, *Model studies, Corn (Field), Evaluation, Irrigation, Irrigation efficiency.
Identifiers: *Soil Conservation Service, Cobb-Douglas, Missouri.

An economic model is developed for analysis of investments in irrigation. The model encompasses the associated problem of temporal allocation of limited irrigation water within the growing season of a single crop. The problem is placed in the framework of stochastic dynamic programming, and it is shown how the algebraic form of the production function for the crop determines the appropriate state variables of the decision process. An application of the model is made to conditions prevalent in central Missouri with corn the irrigated crop. (Holmes-Rutgers)
W71-08824

THE RUNOFF REGIME DURING SUBSURFACE DRAINAGE OF PEAT BOGS (RUSSIAN: REZHIM STOKA PRI OSUSHENII TORFYANIKOV ZAKRYTYM DRENAZHEM),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
For primary bibliographic entry see Field 04A.
W71-08934

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

PROBLEMS OF HYDROLOGIC FORECASTS AND COMPUTATIONS (RUSSIAN: VOPROSY GIDROLOGICHESKIKH PROGNOZOV I RASCHETOV),
Kryzhanovskaya, A.B. (ed), Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76, Moscow, 1969. 152 p.

Descriptors: *Runoff forecasting, *Discharge (Water), *Rainfall-runoff relationships, *Hydrographs, *Watersheds (Basins), Snowmelt, River basins, Base flow, Precipitation (Atmospheric), Peak discharge, Moisture content, Climatic data, Water yield, Flow rates, Statistical methods, Time lag, Water balance, Hydrologic budget.
Identifiers: *Ukrainian rivers, Carpathia, Snow reserves, Balance method, Channel storage, Travel time, Isochrones.

This issue of the serial publication, which contains 16 papers, discusses the results of formulating methods for forecasting some of the characteristics of spring runoff from rivers of the Dnieper and Dniester basins and of rain floods on rivers of Transcarpathia. Studies of snowmelt characteristics and the infiltration capacity of soils during summer at the Boguslav Experimental Station are examined. A number of articles are concerned with computations involving the transformation of water movement in river channels, determination of the ordinates of spring runoff hydrographs, computations of water resources and the water balance of individual river basins, and determination of minimum discharges for Ukrainian rivers. A device for computing runoff on agricultural fields is described. (See also W71-08375 thru W71-08390) (Josefson-USGS)
W71-08374

LONG-RANGE FORECAST OF WATER INFLOW TO THE KIEV RESERVOIR DURING A SPRING HIGH-WATER PERIOD (RUSSIAN: DOLGOSROCHNYY PROGNOZ PRITOKA VODY ZA PERIOD VESENNEGO POLOVOD-'YA K KIYEVSKOMU VODOKHRANILISHCHU),
L. T. Pashova.
In: Voprosy gidrologicheskikh prognozov i raschetov, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76; p 3-16, 1969. 4 fig, 6 tab, 19 ref.

Descriptors: *River flow, *River forecasting, *Snowmelt, Runoff, Melt water, Permeability, River basins, Base flow, Precipitation (Atmospheric), Freezing, Moisture content, Soil moisture, Seasonal, Heat budget.
Identifiers: *Ukraine, Sozh River, Dnieper River, Pripyat' River, Snow storage, Freezing depth.

A method is suggested for computing and forecas ing water flow to he Kiev reservoir during a hig water period, taking into account characteristics spring runoff formation on the Dnieper, Sozh an Pripyat' River basins. Basin water storage befo start of spring snow thaw was determined from regular snow accumlation in the forest and fie and evaporation from the surface of basins duri time of snow melt. An analysis of the formation melt water losses in highly waterlogged, forest areas and expanses with a shallow water tab showed that the soil moisture content of the basin of primary importance in determining amount meltwater loss. Prespring wetting of the upp meter layer of soil was used to describe wat permeability of the soils in the Dnieper and Pripy basins and water storage in a frozen soil layer to dicate water permeability of soils in the Sozh bas Relationships were derived for melt water a function of total maximum snow storage a precipitation during snowmelt and water perme bility of the soils for the three areas studied. (S also W71-08374) (Josefson-USGS)
W71-08375

A METHOD FOR FORECASTING MAXIMU DISCHARGES OF WATER FLOW INTO TH KIEV RESERVOIR (RUSSIAN: METOD PRO NOZA MAKSIMAL'NYKH RASKHOD PRITOKA VODY V KIYEVSKOYE VODO HRANILISHCHE),
A. B. Kryzhanovskoya.
In: Voprosy gidrologicheskikh prognozov raschetov, Ukrainskiy Nauchno-Issledovatel' s Gidrometeorologicheskiy Institut Trudy, No 76 17-22, 1969. 2 fig, 1 tab, 6 ref.

Descriptors: *Runoff forecasting, *Discha (Water), *Flow, *Reservoirs, *Peak dischar Snowmelt, Air circulation, Soil moisture, Seaso Air temperature, Snow cover, Thawing.
Identifiers: *Ukraine, Dnieper River, Sozh Ri Pripyat' River.

A method is proposed for forecasting maxim discharge of water flow into the Kiev reserv based on a discrete account of hydrometeorol cal characteristics of three partial basins. Altho the relationships between maximum w discharges and total spring runoff hydrometeorological factors are quite close, additonal variable describing the change in mospheric circulation during the second half of year is introduced to increase accuracy forecasts. The variable used is the sign of the ference between the indices of atmospheric ci lation during February and the half-sum December and January. It is concluded that ratio of peak flow to basin yield during high-w formation in the Dnieper River basin has a siderable effect on the height of high water, ticularly during years of inadequate soil mois and low rate of snowmelt. Special studies required of hydrologists and weather forecas for working out a method for predicting peak during formation of high water. (See also W 08374) (Josefson-USGS)
W71-08376

ACCOUNTING FOR PEAK FLOW DURIN HIGH-WATER PERIOD IN COMPUTATI AND FORECASTS OF A SPRING RUN MAXIMUM (RUSSIAN: OB UCHETE DRU NOSTI RAZVITIYA POLOVOD'YA RASCHETAKH I PROGNOZAHK VESENN MAKSIMUMA),
M. V. Rudometov.
In: Voprosy gidrologicheskikh prognozo raschetov, Ukrainskiy Nauchno-Issledovatel' Gidrometeorologicheskiy Institut Trudy, No 23-33, 1969. 3 fig, 3 tab, 9 ref.

Descriptors: *Peak discharge, *Discharge (Wa *Runoff forecasting, *Surface runoff, Air tem

e, Moisture content, Seasonal, Frozen soils, teorological data, Watersheds (Basins).
ntifiers: *Ukraine, Desna River, Snow storage, k flow.

nethod for computing and developing a long-ge forecast of maximum discharge of high water the Desna River near Chernigov is examined in nection with the depth of spring surface runoff the ratio of peak flow to basin yield during high er. To prepare a forecast of maximum harge, the depth of spring surface runoff is computed from an earlier proposed method; the e of the ratio of peak flow to basin yield is computed from a relationship which uses max-m snow storage in the basin at the end of winter tiplied by the relative moisture coefficient for a en soil layer, the sum of negative average 10-air temperatures from the start of winter ugh January and the sign of the change in the metric field over the basin from the first half of er (December-January) to the second half ruary). Studies show that introduction of a omputed value of peak flow into a forecast of imum discharge for the Desna River increases tantially its accuracy. (Josefson-USGS)
-08377

MATION OF RAINFALL FLOODS ON THE ORITSA RIVER AND A FORECAST OF IR MAXIMUM DISCHARGES (RUSSIAN: MIROVANIYE DOZHDEVYKH PAVOD-' NA R. LATORITSE I PROGNOZ IKH KSIMAL'NYKH RASKHODOV),
. Pavlenko.
Voprosy gidrologicheskikh prognozov i ietov, Ukrainskiy Nauchno-Issledovatel' skiy ometeorologicheskiy Institut Trudy, No76; p 2, 1969. 2 fig, 9 ref.

riptors: *Runoff forecasting, *Flood forecast-*Base flow, *Moisture content, *Discharge er), Floods, Precipitation (Atmospheric), Air erature, Surface-groundwater relationships, r loss.
ifiers: *Ukraine.

fall-runoff conditions are described for the athian River Latoritsa near Mukachev. The area is 1,380 sq km. An empirical relation-s established between the runoff depth of in-ual floods and precipitation over a computed interval and the moisture content of the soils. nbination of three values was used to describe oisture content: the river preflood discharge d by groundwater, precipitation during lag of num base flow, and air temperature during a f rainfall. Recommendations for determining dwater values are based on the use of the onship of surface and groundwater maxima typical base flow recession curve. A system parating complex floods into individual floods cans of two typical recession curves--surface and groundwater-- is proposed. A forecast of num discharges of floods is based on the rela-ip of the volumes of runoff of individual to their maximum discharges. The forecast od developed insures an accuracy satisfactory eparing forecasts ten hours in advance. (See 71-08374) (Josefson-USGS)
08378

S OF MELT WATER FLOW ALONG ES (RUSSIAN: O SKOROSTYAKH ANIYA TALOY VODY PO SKLONAM),
Deleur.
Voprosy gidrologicheskikh prognozov i tov, Ukrainskiy Nauchno-Issledovatel'skiy meteorologicheskiy Institut Trudy, No 76, p , 1969. 3 fig, 9 ref.

iptors: *Flow rates, *Melt water, *Slopes, r yield, Snowmelt, Ice, Ice-water interfaces, cover, Discharge (Water).
iers: *Ukraine, Slope characteristics, Snow e, Ice crust.

Experimental studies conducted in 1967 at the Boguslav Experimental Hydrologic Field Station in the Dovzhik basin have established a relationship between rates of melt-water flow under snow and the rate of water yield from snow, the surface slope, height of snow in the area of observations and slope roughness. The rate of melt-water flow along slopes varies between 0.23 and 7.5 mm/sec. Flow rates under snow for an ice crust in areas with 9-13 deg slopes average half those in areas with 21-22 deg slopes when water yield rate and height of snow are equal. Given an equal rate of water yield from snow, flow rates along an ice crust are 1.5-3.5 (and occasionally 5) times less when average height of snow is 25-35 cm than when snow heights are 15-20 cm. Flow rates for melt water vary between 0.2 and 7.5 mm/sec when a compact ice crust is present on the soil surface. Given an equal rate of water yield, flow rates for a loose ice crust range from 0.5 to 4.0 mm/sec, which is almost 2-2.5 times less than the rate for a compact crust. The flow rate under snow for ice crust-free soil varies between 2 and 6 mm/sec. Flow rates in an open river course during an initial period of thaw are 10-50 mm/sec and in succeeding periods 200-500 mm/sec. Maximum flow rate in a stream was observed to be 1.25 m/sec. Flow rate in open river courses was examined as a function of their water discharges. However, deviations in the values of flow rates from the line of the relationship averaged plus or minus 15%, which was explained by a failure to take into account the effect of surface slopes. (See also W71-08374) (Josefson-USGS).
W71-08380

PRICIPLES FOR CONSTRUCTING HIGH-WATER HYDROGRAPHS (RUSSIAN: METODICHESKIYE OSNOVY POSTROYENIYA GIDROGRAFOV VYSOKIKH POLOVODIY),
V. I. Moklyak, and P. A. Shkryabiy.
In: Voprosy gidrologicheskikh prognozov i raschetov, Ukrainskiy Nauchno-Issledovatel' skiy Gidrometeorologicheskiy Institut Trudy, No 76, p 71-79, 1969. 2 fig, 3 tab, 5 ref.

Descriptors: *Hydrographs, *Statistical methods, *Probability, *Discharge (Water), *Water balance, Inflow, Melt water, Runoff, Surface runoff, Channel flow, Hydrologic data, Equations, Peak discharge.
Identifiers: *Ukraine, Sozh River, Distribution curves, Balance method.

A statistical genetic method for determining spring high-water discharges, including maximum discharge, equivalent to the total depth of runoff, is examined. Computations are performed by means of water balance equations based on daily layers of flow into a channel network of given excess probability, established from statistical processing of daily layers of flow for previous years. The results of computations make it possible to determine maximum discharges of very low excess probability (less than 1%) and thus refine the distribution curve of excess probabilities of maximum discharges, which in this zone is not usually based on observation data. The computed maximum discharges within the zone of very low excess probabilities are often below the discharges determined by the three-parameter gamma distribution curve, whose parameters have been computed from long-term annual maximum discharge values for melt water. To illustrate the computation method proposed, hydrograph discharges and maximum discharges of the Sozh River near Gomel' with an excess probability of 1.0, 0.1 and 0.01% are used. (See also W71-08374) (Josefson-USGS)
W71-08381

DETERMINING UNIT INFLOW OF MELT WATERS FROM A BASIN BY A UNIT HYDROGRAPH (RUSSIAN: OPREDELENIYE ELEMENTARNOGO PRITOKA TALYKH VOD S BASSEYNA PO YEDINICHNOMU GIDROGRAFUL),
Ya. A. Fomenko.
In: Voprosy gidrologicheskikh prognozov raschetov, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76, p 80-85, 1969. 2 fig, 1 tab, 9 ref.

Descriptors: *Unit hydrographs, *Melt water, *Inflow, *Discharge (Water), Runoff, Time lag, River flow, Water yield, Recession curves.
Identifiers: *Ukraine, Desna River, Channel storage, Lag coefficients.

A genetic method for computing the transforming effect of a channel capacity on inflow into a river network from a basin during formation of high waters is examined. Computation of unit inflow by means of retransformation of observed discharges of runoff hydrographs is based on construction of a hydrograph from refined genetic runoff formulas and on a theoretical method of determining a unit hydrograph by lag coefficients. Ordinates of a unit hydrograph are computed on the basis of a chart of basin unit widths and a chart of basin widths constructed from the maximum rate of lag of a flood wave. Used in the computations are ratios between maximum velocity of wave frontal movement and average velocity by river length and between the volumes of channel storage and their corresponding discharges. Lag coefficients are computed from formulas which take into account the most probable structure of river flow, determined by roughness and shape of the channel course and the river floodplain. Unit inflow of melt waters from the Desna River basin to Bryansk during a 1931 high-water period is used as an example of computation. Maximum daily unit inflow is determined two days before maximum discharge of high water and equals 31.8 mm/day, which amounts to 1.82 of the maximum runoff depth (17.5 mm/day) and 0.20 of the total runoff depth (162 mm) for 16 days of intensive inflow of melt waters from the basin into the river network. The unit hydrograph method is recommended for use in determining daily rate of inflow and for analyzing typical shapes for unit inflow charts. (See also W71-08374) (Josefson-USGS)
W71-08382

STUDY OF THE RELATIONSHIP OF A RUNOFF COEFFICIENT TO HYDROGRAPHIC CHARACTERISTICS OF A RIVER AND LAG TIME OF A FLOOD WAVE (RUSSIAN: ISSLEDOVANIYE ZAVISIMOSTI KOEFFITSIENTA OTTOKA OT GIDROGRAFICHESKIKH KHARAKTERISTIK REKI I VREMENI DOBEGANIYA PAVODOCHNOY VOLNY),
Ya. A. Fomenko.
In: Voprosy gidrologicheskikh prognozoy i raschetov, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76, p 86-91, 1969. 3 fig, 14 ref.

Descriptors: *Runoff coefficient, *Channel morphology, *Floods, *Time lag, Chezy equation, Mannings equation, Roughness (Hydraulic), Hydraulic properties, Flow, Watersheds (Basins).
Identifiers: *Ukraine, Dnieper River, Southern Bug River, Severskiy Donets River, Azov Sea.

Although the relationship of the runoff coefficient to a basin area or river length has not been adequately expressed, it can, in individual homogeneous geomorphological regions, be more specific when taking into account a stream gradient. A stream gradient is dependent upon the geomorphological characteristics of a channel and, to a certain extent, determines the capacity of channel storage and lag time of a flood wave. By taking into account the extent of forested areas and the waterlogged state of a basin, a clearer relationship can be derived between coefficients of runoff and causative factors. The runoff coefficients, as a function of lag time, are determined graphically by the relationship between observed discharges of consecutive days at time of recession of high waters for 160 sites and the runoff from rivers of the Dnieper, Southern Bug, Severskiy Donets and Azov Sea basins. It is suggested that lag time be computed from average lag velocity according to

the Chezy-Mamming formula, which takes into account the shape and roughness of a channel and flood-plain, stream gradient and magnitude of maximum discharge. (See also W71-08374) (Josefson-USGS)
W71-08383

FIELD STUDIES OF THE INFILTRATION CAPACITY OF SOILS (RUSSIAN: O POLEVYKH ISSLEDOVANIYAKH VPITYVAYUSHCHEY SPOSOBNOSTI POCHVOGRUNTOV),
N. G. Galushchenko.
In: Voprosy gidrologicheskikh prognozovi raschetov, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76; p 92-98, 1969. 2 fig, 8 ref.

Descriptors: *Infiltrometers, *Infiltration, *Artificial precipitation, *Sprinkler irrigation, *Soils, Watersheds (Basins), Topography, On-site investigations, Ravines, Forests, Permeability, Runoff.
Identifiers: *Ukraine, Artificial sprinkling, Infiltration rate.

Experimental field studies of the infiltration capacity of soils on forested and field sections of the Boguslav Hydrologic Field Station were conducted by means of artificial sprinkling and flooded plots (infiltrometers). In a basin west of Boguslav, infiltrometers yielded values too high as compared with sprinkled plots. In forested areas the ratios obtained from infiltrometers during initial periods were usually 5-10 times those obtained by sprinkling methods and, in individual cases, 60-100. In open areas the difference was less and did not exceed 7-45. The difference in infiltration values from readings of flooded plots and artificial sprinkling decreased with time, amounting to 2-5 in the forest after 30-40 minutes and 2 in field areas. Readings of infiltrometers and sprinkled plots differed with respect to total depth of absorbed water and the time required for a steady infiltration value. Depending upon the sprinkling rate and its duration, the depth of absorbed water in forested areas was 2-10 times less from artificial sprinkling than from infiltrometers; in open areas the ratio was considerably less and in individual instances was equal to unity. In forested areas a relatively steady infiltration value during sprinkling was established 3-6 times more rapidly than in infiltrometers and in open areas the ratio of these time intervals did not exceed 2. An appreciable difference (10-11-fold) in infiltration values was also observed at the end of the third hour of experiments, using the two methods described. (See also W71-08374) (Josefson-USGS)
W71-08384

DETERMINING PARAMETERS OF A UNIT HYDROGRAPH (RUSSIAN: K OPREDELENIYU PARAMETROV ELEMENTARNOGO GIDROGRAFA),
T. A. Chekushkina.
In: Voprosy gidrologicheskikh prognozov i raschetov, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76; p 99-106, 1969. 2 fig, 3 tab, 5 ref.

Descriptors: *Unit hydrographs, *Discharge (Water), *Watersheds (Basins), *Time lag, Channel flow, Channel morphology, Chezy equation, Mannings equation, Roughness (Hydraulic), Geomorphology.
Identifiers: *Ukraine, Sozh River, Ingul River, Berezina River, Isochrones, Travel time, Moklyak curve.

Discharges of a high-water hydrograph can be quite accurately computed by using a unit hydrograph whose ordinates must be based on an accurate determination of the number of isochrones in a basin and the initial lag coefficients between isochrones. The value of the initial lag coefficient between isochrones for each specific basin may be assumed to be constant for a number of years of high water, since the pattern of increased discharges and drainage of a basin varies little under specific geomorphological conditions with minor fluctuations in high-water content. Ordinates of a unit hydrograph vary with change in lag time, which depends upon the magnitude of maximum discharge and redistribution of the coefficients of basin width. In similar-size basins such as the Ingul River basin near Novogorozheno and the Berezina near Borisov, channel flow may be variously formed, which calls for a careful approach to the problem of selecting initial lag coefficients as a function of the physico-geographic conditions of a basin. In constructing a unit hydrograph for partially waterlogged basins it may be necessary to assume variables of the initial lag coefficients for reaches between isochrones in order to accurately account for the transformation characteristics of discharges for individual reaches of a river. (See also W71-08374) (Josefson-USGS)
W71-08385

COMPUTING DISCHARGES OF HIGH WATER FROM PARTIAL BASINS BY UNIT HYDROGRAPHS (RUSSIAN: O VYCHISLENII RASKHODOV POLOVOD'YA PO ELEMENTARNYM GIDROGRAFAM S CHASTNYKH BASSEYNOV),
T. A. Chekushkina.
In: Voprosy gidrologicheskikh prognozov i raschetov, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76; p 107-111, 1969. 2 fig, 2 tab, 11 ref.

Descriptors: *Discharge (Water), *Unit hydrographs, *Watersheds (Basins), Time lag, Reservoirs, Chezy equation, Mannings equation, Roughness (Hydraulic).
Identifiers: *Ukraine, Seym River, Travel time, Lag coefficients.

A possibility of obtaining high-water discharge values at a discharge site as a sum of individual hydrographs of partial basins is examined. To derive daily discharges, a unit hydrograph method is used in distributing lag coefficients along a model lag curve. The computation method cited yields satisfactory results and can be used to resolve problems associated with the separation of a basin into parts, particularly in studying the regulating effect of reservoirs in a basin on discharges at a site. For computation purposes, the Seym River basin, covering an area of 25,600 sq km, was used to compute discharge. A comparison of computation results showed that a total hydrograph derived by the summation of discharges from two partial basins was somewhat closer to a recorded hydrograph than a hydrograph determined for an entire basin as a whole. Future investigations will be directed at resolving the problem by dividing a whole basin into several sub-basins. (See also W71-08374) (Josefson-USGS)
W71-08386

A DEVICE FOR MEASURING RUNOFF FROM CROP ROTATION FIELDS (RUSSIAN: USTROYSTVO DLYA IZMERENIYA STOKA VODY NA POLYAKH SEVOOBOROTA),
N. V. Pikush.
In: Voprosy gidrologicheskikh prognozov i raschetov, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 76; p112-115, 1969. 2 fig, 3 ref.

Descriptors: *Flowmeters, *Discharge measurement, *Crops, *Rotations, Instrumentation, Irrigation, Agriculture.
Identifiers: *Ukraine, Dnepropetrovsk oblast, Crop rotation fields.

Because of their simplicity and convenience and the fact that they do not interfere with agricultural work, a flowmeter or device for partial volumetric measurement of water discharge and runoff from crop rotation fields is recommended. Laboratory and on-site tests along with two years of experience in the use of a number of flowmeters on irrigation fields have revealed that flowmeters are reliable even the lowest gradients, are relatively unaffect by silt and insure a water discharge measureme accuracy of plus or minus 3%. Runoff plots of 20 25 m equipped with flowmeters consisting of a tu 20-cm high and 10-cm wide, designed to pen discharges up to 20 liter/sec, have been in use the Sofiyevka Rayon of the Dnepropetrovsk Ob since 1965. Experience has shown that the dev and operation of these plots are more expedi than hitherto used equipment. (See also W 08374) (Josefson-USGS)
W71-08387

WATER RESOURCES AND WATER BALAN OF THE UKRAINE AND MOLDAVIA (R SIAN: VODNYYE RESURSY I BALANS V UKRAINY I MOLDAVII),
L. G. Onufriyenko.
In: Voprosy gidrologicheskikh prognoz raschetov, Ukrainskiy Nauchno-Issledovatel' Gidrometeorologicheskiy Institut Trudy, No 7 116-130, 1969. 5 fig, 6 tab, 13 ref.

Descriptors: *Water balance, *Water resour *Water consumption, *Runoff forecasting, *R basins, Moisture content, Runoff coefficient, noff, Precipitation (Atmospheric), Evapora Watersheds (Basins), Meteorological data.
Identifiers: *Ukraine, *Moldavia, Desna R Tissa River, Dnieper River, Dniester River, Se skiy Donets River, Southern Bug River.

New runoff data computed from cyclic varia in water content and from the influenc economic activity on runoff were used to study resources and water balance of river basins o Ukraine and Moldavia and of individual phy geographic zones. Resources were computc connection with requirements for finding met of preparing water balances for an average and for low-water years of 75 and 95% probab Local runoff for the Ukraine for an average was 50.251 cu km and runoff entering the Uk from other republics 34.748 cu km; for Mol runoff values for an average year were 0.670 9.985 cu km, respectively. Precipitation, r and evaporation values for the Ukraine were mm, 83 mm and 526 mm, respectively; for davia these values were 517 mm, 20 mm and mm. Water resources of the Ukraine represent about 1.2% of the total figure for the Soviet U and those of Moldavia only 1%, which fo average year equals 4,358 cu km. Projecting a only the Desna and Tissa Rivers and their tri ries appear able to satisfy fully future water sumption needs. The water resources o Dnieper and its tributaries--the Ros', Sula, Pse Vorskla--and of the Western Bug, Seret and rivers, while meeting annual water needs providing sanitary disposal, fail to satisfy max seasonal requirements. The Dniester, Sev Donets, Mius, Kal'mius, Southern Bug and Rivers and rivers of the Crimea meet neith nual nor peak season demands. (See also 08374) (Josefson-USGS)
W71-08388

FLUCTUATIONS IN MINIMUM RUNOFF RIVERS OF THE UKRAINE (RUS KOLEBANIYA MINIMAL'NOGO STOKA UKRAINY),
K. A. Lysenko.
In: Voprosy gidrologicheskikh prog raschetov, Ukrainskiy Nauchno-Issledovat Gidrometeorologicheskiy Institut Trudy, No 131-135, 1969. 1 fig 1 tab, 9 ref.

Descriptors: *Runoff forecasting, *Low flow face-groundwater relationships, *Hydrologic Precipitation (Atmospheric), Rivers, Sta methods.
Identifiers: *Ukrainian rivers, Cyclic vari Low-water periods, High-water periods.

In drawing up recommendations for con minimum runoff for rivers of the Ukraine f

ns in minimum runoff were studied for determin- maximum low-water periods within which vest minimum runoff values are possible. nimum discharges on small Ukrainian rivers are rmed mainly by the inflow of groundwaters ose magnitude and yield are determined by at- spheric precipitation and other physico-geo- aphic factors. The greatest number of observa- ns of minimum runoff in the Ukraine were con- cted on the Desna, Severskiy Donets and Dni- er Rivers for a period of 65-69 years and on the r', Tur'ya, Uzh, Sula, Southern Bug and Rov ers for 40-50 years. Integral curves of fluctua- ns in minimum runoff for the Desna, Severskiy nets and Dniester Rivers revealed a successive periodic alternation of high-water and low- er periods (half cycles) of varied duration rang- from 8 to 46 years. Average water content for ividual cycles for the period 1940-1962 iated little from the average long-term value (by % and only in individual instances by as much as 14%). Long term changes in groundwater level e subjected to cyclic fluctuations wherein a chronism in the fluctuations of minimum charges of rivers and of groundwaters forming m could be seen. Study of long-term fluctua- s in minimum runoff makes it possible to deter- e the maximum low-water period characteristic ivers of a specific zone and to identify in this od the years which will have a rare recurrence inimum runoff. (See also W71-08374) (Josef- -USGS)
1-08389

TIMAL LENGTH OF REACH AND TIME IN- RVAL IN COMPUTATIONS OF UNSTEADY VEMENT OF WATER USING THE THOD OF G. P. KALININ AND P. I. MILYU- V (RUSSIAN: OPTIMAL'NYYE DLINA HASTKA I INTERVAL VREMENI PRI SCHETAKH NEUSTANOVIVSHEGOSYA IZHENIYA VODY PO METODU G. P. LININA I P. I. MILYUKOVA),
Zheleznyak, and A. I. Shereshevskiy.
Voprosy gidrologicheskikh prognozovi i hetov, Ukrainskiy Nauchno-Issledovatel'skiy rometeorologicheskiy Institut Trudy, No 76; p -143, 1969. 2 fig, 1 tab, 5 ref.

criptors: *Waves (Water), *Time lag, *Runoff, scharge (Water), *Design data, Hydrographs, hematical studies, Design flood, Design flow. tifiers: *Ukraine, Water movement.

reliability of simplified computations of the ement of flood waves using the Kalinin-Milyu- method can be substantially increased if ad- d values of runoff for typical reaches are ated by computations for design reaches. Such bstitution is particularly desirable when lag within a typical reach is more than the design interval. Computations of water movement for hes whose length has been determined by harges within the entire range of their changes the observance of the condition 'delta t is ap- imately equal to lag time' permit computations e performed with a maximum possible accuracy simplified computations, and insure coin- nce in time and magnitude of maximum and mum water discharges. It would be inadvisable erform computations when delta t is much less lag time, since a computation for small design intervals with a relatively smooth change in harges, while increasing volume of computa- , does not increase their reliability. One may ne delta t to be much more than lag time only the design interval describes in sufficient l the rate of discharges during a flood period. from field observations of the movement of d waves downstream from the dam of the Ivan'- kaya Hydroelectric Powerplant in August were used as a basis for computations. (See W71-8374) (Josefson-USGS)
-08390

ECTION OF OPTIMUM PLAN FOR IM- VEMENTS IN NASSAU, NEW PROVIDENCES, BAHAMAS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-08510

STABILITY OF RIPRAP AND DISCHARGE CHARACTERISTICS, OVERFLOW EMBANK- MENTS, ARKANSAS RIVER, ARKANSAS: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-08514

DEVELOPMENT OF WATER RESOURCES IN THE KHMER REPUBLIC.
Economic Commission for Asia and the Far East, New York.

Water Resources Journal, United Nations Economic Commission for Asia and the Far East (ST/ECAFE/SER. C/87), p 1-44, Dec 1970. 44 p, 10 fig, 12 tab, 9 ref.

Descriptors: *Water resources development, *Planning, *River basin development, Deltas, Rivers, Water supply, Water management (Applied), Monsoons, Flood control, Dams, Reservoirs, Hydroelectric power, Irrigation water.
Identifiers: *Khmer Republic, *Indochinese Peninsula.

The Khmer Republic is situated in the southwestern corner of the Indochinese peninsula. The dominant geographical feature is the Mekong river which plunges over the Khone Falls at the border with Laos and courses through many rapids between the town of Khone and Kratie before gradually becoming wider and less turbulent and flowing in a generally southerly direction through the eastern part of the central Khmer plain. South of Phnom Penh, the capital, it splits into two branches, the eastern branch continuing to be known as the Mekong, while the western branch is named the Bassac river. It is estimated that as many as 4 million people, or more than 60% of the total population, do not have access to piped water supplies. The development of the water resources of the Khmer Republic cannot be separated from the comprehensive development of the entire lower Mekong basin, which is being implemented under the Mekong project. A brief description is given of the status of the major mainstream and tributary projects in the Khmer Republic under the Mekong Indicative Basin Plan. (Knapp-USGS)
W71-08546

EFFECT OF LAND USE ON THE HYDROLOGY OF SMALL WATERSHEDS IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, La Crosse, Wis.
Richard S. Sartz.
Symposium on the Results of Research on Representative and Experimental Basins, Wellington, New Zealand, December 1-8, 1970. Publication No 96, International Association of Scientific Hydrology, p 286-295.

Descriptors: *Storm structure, *Rainfall disposition, *Small watersheds, *Sediment yield, Agricultural watersheds, Forestry, Unit hydrographs, Land use, Wisconsin, Overland flow, Storm runoff.
Identifiers: Experimental watersheds.

Overland flow and sediment discharge were measured on small single land use watersheds and natural runoff plots in southwestern Wisconsin's unglaciated region. Forest watersheds produced overland flow only after heavy rains, and the amounts of flow and peak rates were low compared with those from open-land watersheds. Peak flow rates from a major storm ranged from 64 millimeters per hour for tilled land to no flow for undisturbed forest. Analysis of the flows from five large storms in 1 year showed that peak rates from tilled land averaged 2.5 times those from meadow, and peak rates from meadow 1.4 times those from an abandoned field. Peak rates from heavily grazed pasture were 3.0 times those from lightly grazed pasture. Suspended sediment content of the runoff water ranged from 238,000 parts per million for tilled land to 0 parts per million for undisturbed forest. Sediment content was low for forest, abandoned field, and meadow, but high for tilled land and heavily grazed pasture.
W71-08839

WATER QUALITY MANAGEMENT DATA AS- SOCIATED WITH RESERVOIR OPERATIONS,
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-08885

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN NEW YORK.
Corps of Engineers, New York. North Atlantic Div.

Army Corps of Engineers Water Resources Development Report, Jan 1971. 153 p.

Descriptors: *Water resources development, *New York, *Engineering structures, Surface waters, Navigation, Navigable waters, Bridges, Flood control, Reservoirs, Beach erosion, Dams, Hurricanes, St Lawrence Seaway, Sedimentation.
Identifiers: Niagra River, Niagra Falls.

This report provides current information on the scope and progress of water resources development within the State of New York by the United States Army Corps of Engineers. It describes briefly the Corps' role in planning and building these improvements and includes an explanation of the procedure for initiating and processing them. Information is given on the status of the various projects, whether the work is completed, is underway, or has not been started. The projects are concerned with navigation, alteration of bridges over navigable waterways, flood control, reservoirs, lakes, beach erosion, hurricane protection, St. Lawrence Seaway, and Niagra remedial works. (Woodard-USGS)
W71-08902

GENERAL HYDRAULIC SYSTEM MODEL,
Illinois Univ., Urbana. Dept. of Hydraulic Engineering; and Madras Univ., India College of Engineering.
Ven Te Chow, and V. C. Kulandaiswamy.
ASCE Proceedings, Journal of the Hydraulic Division, Vol 97, No HY6, Paper 8176, p 791-804, June 1971. 14 p, 4 fig, 1 tab, 8 ref, append.

Descriptors: *Simulation analysis, *Mathematical models, *Numerical analysis, *Systems analysis, *Flood forecasting, Streamflow forecasting, Model studies, Routing, Input-output analysis, Peak discharge, Runoff, Storm runoff, Unit hydrographs, Hydrograph analysis, Design storm, Design flow, Design flood.
Identifiers: Hydrologic models, Hydrograph synthesis.

A lumped, deterministic, nonlinear mathematical model is developed and proposed for the simulation of hydrologic systems. The model is developed from expansion of a general storage function of input and output in Taylor's series about a steady state. The model recommended for practical application is based on the system model in the form of a third-order differential equation. It is a quasi-nonlinear model because the coefficients of the differential equation are considered as functions of the peak discharge of direct runoff. In the analysis of the model, watershed is taken as the hydrologic system. Nine watersheds with more than 70 major and minor storms were used in the analysis and verification of the recommended model. The

results indicate a very satisfactory simulation of watershed hydrologic systems by the model. (K-napp-USGS)
W71-08909

FLOOD PLAIN INFORMATION-WEST BRANCH BRANDYWINE CREEK.
Corps of Engineers, Philadelphia, Pa.

Army Corps of Engineers Flood Plain Report, Mar 1970. 48 p, 5 fig, 16 plate, 9 tab.

Descriptors: *Floods, *Flood damage, *Pennsylvania, Flood plains, Regional flood, Flood forecasting, Flood control, Historic flood.
Identifiers: *West Branch Brandywine Creek, *Chester County (Penn), Standard project flood, Intermediate regional flood.

Flooding along the West Branch Brandywine Creek from the junction of the East and West Branches in the southeast portion of Chester County upstream to the northern limits of the City of Coatesville, Pennsylvania is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. Flood stages can rise from normal flow to extreme peaks in a relatively short period of time. During the flood of August 9, 1942 the West Branch Brandywine Creek in the Coatesville area had a maximum rate of rise of 7 feet per hour and remained out of banks for about 9 hours. During a Standard Project Flood at the same location, the stream would rise 18 feet in 10 hours and would remain out of banks for about 30 hours. (Woodard-USGS)
W71-08911

FLOOD CONTROL STUDY OF RIO GRANDE DE MANATI, MANATI AND BARCELONETA, PUERTO RICO.
Flavio Acaron and Associates, San Juan (Puerto Rico).

Available from the National Technical Information Service as PB-196 488, $3.00 in paper copy, $0.95 in microfiche. Flavio Acaron and Associates Consulting Engineers Flood Control Report, June 1970. 123 p, 43 exh, 42 tab, 15 ref.

Descriptors: *Flood control, *Flood protection, *Flood damage, *Flood plains, *Puerto Rico, Regional flood, Flood forecasting, Watershed management, Levees, Flood forecasting, Watershed management, Levees, Flood routing, Hurricanes, Streamflow, Runoff, Channel improvement.

Flooding along the Rio Grande de Manati watershed in Puerto Rico is described to aid in solving flood control problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The principal cause of major flooding has been the passage of hurricanes and of tropical disturbances over or near the island of Puerto Rico; however, in some occasions concentrated abnormal rainfall has caused flood stages that have been equal to or greater than those generated by rainfall during the passage of hurricanes and of tropical disturbances. To achieve an effective flood control plan, several structures and measures are described. (Woodard-USGS)
W71-08919

THE RUNOFF REGIME DURING SUBSURFACE DRAINAGE OF PEAT BOGS (RUSSIAN: REZHIM STOKA PRI OSUSHENII TORFYANIKOV ZAKRYTYM DRENAZHEM),
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
V Ya. Chernenok.
Gidrotekhnika i Melioratsiya, No 1, p 66-69, January 1971. 4 p, 2 fig, 3 tab.

Descriptors: *Runoff, *Subsurface drainage, *Subsurface drains, *Bogs, *Drainage effects, Soils, Discharge (Water), Seasonal, Precipitation (Atmospheric), Porbability.
Identifiers: *USSR, Peat bogs, Water regime, Growing season, Bog drainage.

Studies conducted in 1961-69 on the Yakhroma River floodplain have established that maximum discharges of 10% probability during subsurface drainage of peat bogs with drains at a depth of 1.7-2.0 m and spaced 20 and 40 m apart were 0.66 and 0.58 liter/sec/ha: maximum discharges during the presowing season were 0.45 and 0.44 liter/sec/ha, respectively. Maximum discharges of 10% probability during subsurface drainage with drains at depths of 0.8-1.2 m and spaced 20 and 40 m apart were 0.81 and 0.79 liter/sec/ha, with maximum discharges during the presowing season 0.56 and 0.67 liter/sec/ha, respectively. Average monthly discharges for the May-September periods from 1962-69 during subsurface deainage of peat bogs did not exceed 0.2 liter/sec/ha. A maximum discharge of 1.64 liter/sec/ha was observed in June 1965 in an area of intense precipitation (56.3 mm), where drains had been placed to depths of 0.8-1.2 m and set 20 m apart. Macimum discharges of 1-10% probability during subsurface drainage to depths of 1.7-2.0 m with drains 20 and 40 m apart were 24-27% lower than values obtained from installing drains to a depth of 0.8-1.2 m. (Josefson-USGS)
W71-08934

4B. Groundwater Management

WATER RESOURCES IN THE UPPER STONES RIVER BASIN, CENTRAL TENNESSEE,
Geological Survey, Nashville, Tenn.
For primary bibliographic entry see Field 02F.
W71-08330

WATER RESOURCES OF WARD COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02F.
W71-08331

THE USE OF WELL LOGGING IN RECHARGE STUDIES OF THE OGALLALA FORMATION,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 02F.
W71-08352

NOTE ON HYDROLOGICAL RESEARCH IN BOTSWANA WITH SPECIAL EMPHASIS ON RESEARCH IN THE HYDROGEOLOGICAL FIELD,
Botswana Geological Survey, Lobatse.
C. M. H. Jennings.
South African Journal of Science, Vol 67, No 1, p 12-21, Jan 1971. 1 fig, 13 ref.

Descriptors: *Hydrogeology, *Groundwater basins, *Boreholes, *Semiarid climates, *Subsurface investigations, On-site investigations, Drainage basins, Climatic data, United Nations, Aquifers.
Identifiers: *Botswana, *Kalahari Desert.

Botswana, located in southern Africa, is a vast semiarid tableland with erratic rainfall. A few rivers in the north are perennial, but most drainages are ephemeral. Arable soils suitable for irrigation are too far from the northern area waters to allow for economical pumping schemes. The agricultural potential of the nation is therefore limited, and the major industry is cattle raising. Both cattle and men are dependent upon groundwater supplies that are rapidly becoming depleted. Mineral finds have been made, indicating the potential of a mining industry if water supplies are adequate. A great de of hydrogeological research has been carried out recent years and observation boreholes have bee developed. Borehole water level measuremen combined with data on rainfall and groundwat consumption have yielded information on sa yields, infiltration rates, transmissibility and stora capacity. C-14 and stable isotope studies in certa Kalahari ranching areas should yield data on a and origin of groundwaters as well as aquif characteristics. (Casey-Arizona)
W71-08467

PUBLIC HEALTH ASPECTS OF INDIVIDU WATER WELLS,
Monroe County Health Dept., Mich.
For primary bibliographic entry see Field 05G.
W71-08470

ESTIMATED WATER USE IN NEVADA,
Geological Survey, Carson City, Nev.; and Neva State Dept. of Conservation and Natu Resources, Carson City.
For primary bibliographic entry see Field 06D.
W71-08526

USE OF WELLS AND PITS TO RECHARGE U DERGROUND FORMATIONS IN SEMI-AR AREAS,
Texas Tech Univ., Lubbock, Tex. Dept. of Agri tural Engineering.
Marvin J. Dvoracek.
Available from the National Technical Informat Service as PB-199 829, $3.00 in paper copy, $0 in microfiche. Paper presented at Internatio Conference on Arid Lands in a Changing Wo June 3-13, 1969, Arizona University, Tucson. 1 14 ref. OWRR Project B-041-TEX (1).

Descriptors: *Artificial recharge, *Pit recha *Groundwater recharge, *Natural recha *Water reuse, Water wells, Multiple-purpose re voirs, Induced infiltrations, Reclaimed water, In tion, Recharge wells, Inflow, Diffusivity, Aqu characteristics, Confined water, Groundw basins, Hydrogeology, Permeability, Poro Porous media, Specific retention, Undergro storage, Water sources.
Identifiers: Imported water, *Sub-surface w storage.

A general discussion is given of the diffe methods that can be employed in artificial gro water recharge in semi-arid areas. Emphas placed on the need to collect and retain amounts of summer rainfall before it is lost thr mass evaporation and surface runoff. The us wells and specially constructed pits in additio trenches and rubble cones as collection reser for artificial groundwater recharge is discussed suggested. (Glasby-USGS)
W71-08534

THE PROTECTION OF GROUNDWA RESOURCES.

Water Well Journal, Vol 24, No 7, p 31-33, 1970. 3 p.

Descriptors: *Groundwater, *Water reso development, *Water wells, *Water quality trol, *Hydrogeology, Reviews, Water manage (Applied), Governments, Water conserv Water supply, Regulation, Aquifers, Inje wells, Water pollution sources.
Identifiers: *Groundwater protection.

Information concerning protection of ground resources was assembled from many author sources and reviewed under the following topics: (1) the protection of ground resources; (2) the availability and use of gr water; (3) the classification of groundwater tants; (4) groundwater pollution from s sources; (5) groundwater pollution from p

ion wells; (6) groundwater pollution from injec-
ion wells; (7) the purification of polluted ground-
water; (8) the role of federal legislation; (9)
overnmental responsibilities in groundwater
anagement; and (10) sharing the responsibility.
Woodard-USGS)
W71-08542

**HE HYDROGEOLOGICAL INVESTIGATION
F FISSURE-FLOW BY BOREHOLE LOGGING
ECHNIQUES,**
nstitute of Geological Sciences, London (En-
land). Dept. of Hydrogeology.
or primary bibliographic entry see Field 02F.
V71-08547

**OME ASPECTS OF THE TRIASSIC AQUIFER
N EAST DEVON AND WEST SOMERSET,**
herrell (Frederick) Engineering Geologists,
avistock (England).
or primary bibliographic entry see Field 02F.
71-08548

**CONTRIBUTION TO THE ANALYSIS OF
ECOVERY DATA FOR THE DETERMINA-
ION OF THE HYDRAULIC PROPERTIES OF
N AQUIFER,**
eological Survey of Denmark, Copenhagen.
vonimir Haman, and Lars Jorgen Anderson.
enmark Geological Survey, Series 3, No 37,
970. 24 p, 7 fig, 2 tab, 8 ref.

escriptors: *Groundwater, *Pumping, *Aquifer
aracteristics, *Hydraulic properties, *Recharge,
ansmissivity, Storage coefficient, Aquifers,
athematical studies, Equations, Withdrawal,
awdown, Analytical techniques, Artesian wells,
ater levels, Barometric efficiency, Atmospheric
essure.
entifiers: *Aquifer tests, *Aquifer evaluation,
umping tests.

reliable calculation of hydraulic properties
oefficients of transmissivity and storage for the
awdown data of an aquifer) utilizes recovery data
stead of residual drawdown data. A useful formu-
computes the recovery from the extrapolated
awdown. Data were obtained from a pumping
t in an artesian aquifer at Hvinningdal, Sil-
borg, Denmark. The calculations were made by
eans of the nonequilibrium formulas of Theis and
ob. In addition, procedures and examples of ad-
tments of water-level data for barometric effi-
ncy are given. (Woodard-USGS)
71-08549

**SIN RECHARGING THE OGALLALA
QUIFER THROUGH PLEISTOCENE SEDI-
ENTS,**
ricultural Research Service, Bushland, Tex. Soil
l Water Conservation Research Div.
S. Aronovici, Arland D. Schneider, and Ordie R.
es.
The Ogallala Aquifer--A Symposium, Texas
ch University, Lubbock, International Center for
d and Semi-Arid Land Studies Special Report
39, p 182-192, 1970. 11 p, 4 fig, 10 ref.

escriptors: *Pit recharge, *Infiltration, *Texas,
quifers, Alluvium, Permeability, Unsaturated
w, Artificial recharge, Groundwater recharge,
colation, Water spreading, On-site tests,
drogeology.
ntifiers: *Ogallala aquifer (Texas).

charge in permeable hardland soils of the High
ins of Texas is negligible, and the Ogallala
ifer is cut off from any other appreciable water
rce. The relief of the hardlands is characterized
numerous playas or depressions in which most
rm runoff collects. The playa bottoms are
ally blanketed with clay, which retards
nward percolation. Between 1.8 and 5.7 mil-
acre-feet annually are wasted by evaporation
m playas. A site 600 feet from a playa at Bushland, Texas, was used for basin recharge tests. Two 66-foot square basins with 1:1 side slopes were excavated to expose the unconsolidated caliche layer approximately 4 feet below ground surface. Neutron moisture meter access tubes and several piezometers were installed. Playa water containing suspended solids was applied. Percolation rates rose until 0.92 pound of sediment per square foot of basin was added. Suspended solids definitely reduced percolation rates, but zooplankton may have had an equally important influence. The main advantage of basin recharge is the relative low cost and ease of sediment removal should it be necessary. (See also W71-08349 thru W71-08357) (Knapp-USGS)
W71-08570

WATER TRANSFER AT BEDROCK-ALLUVIUM CONTACTS,
Colorado State Univ., Fort Collins. Dept. of Geology.
For primary bibliographic entry see Field 02F.
W71-08572

PROBLEMS OF ARTIFICALLY RECHARGING THE OGALLALA FORMATION IN COLORADO,
Geological Survey, Denver, Colo.
C. T. Jenkins, and W. E. Hofstra.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 154-164, 1970. 11 p, 5 fig, 5 ref.

Descriptors: *Artificial recharge, *Colorado, *Aquifers, *Alluvium, Infiltration, Alluvial channels, Water spreading, Permeability, Transmissivity, On-site tests, Rainfall, Water supply, Playas, Water conservation, Water reuse, Hydrogeology.
Identifiers: *Ogallala aquifer (Colorado).

Two studies relating to artificial recharge were made by the U. S. Geological Survey in the northern High Plains of Colorado in 1969. The studies consisted of an evaluation of water available in Kit Carson County, Colorado, and test drilling near Akron, Colorado. Less than 1 percent of the average annual precipitation, which is about 16 inches, leaves the area as surface runoff. This limited amount of water available for increasing recharge probably precludes the construction of large recharge projects. However, the study indicated that significant natural recharge occurs in some ephemeral stream channels. The test-drilling study showed that many poorly permeable lenses within the Ogallala Formation inhibit recharge. Some water might be salvaged from playas either by pumping the water for reuse onto cropped land or by recharging it to the aquifer through wells. (See also W71-08349 thru W71-08357) (Knapp-USGS)
W71-08574

WASTE OF ARTESIAN WATERS IN EAST STYRIA (GERMAN: RAUBBAU AN ARTESISCHEM WASSER IN DER OSTSTEIERMARK),
Technische Hochschule, Graz (Austria). Institut fuer Mineralogie und Technische Geologie.
F. Ronner, and J. Schmied.
English abstract. Steirische Beitrage zur Hydrogeologie, No 20, Graz, p 63-80, 1968. 18 p, 1 tab, append.

Descriptors: *Artesian wells, *Water yield, *Hydrogeology, Groundwater movement, Water utilization, Irrigation water, Water loss, Confined water, Water levels, Water table, Consumptive use, Water law, Water rights, Water balance.
Identifiers: *Styria (Austria), *Austria.

In the tertiary basin of Styria and southern Burgenland, 287 flowing and 51 non-flowing artesian wells produce water which largely runs off unused. The 287 flowing wells yield about 3280 cu m per day. From these, a population of 1550 and their irrigated farms are supplied. Daily consumption is about 110 liters per person. The balance of 3,116,000 liters per day runs off unused, which means that 5% is actually consumed and 95% is wasted. It is possible that the limits of safe yield have already been overstepped. According to the Austrial Water Law of 1959 artesian wells must be reported to, and approved by, the authorities, but the law contains no definition of the term 'artesian well'. (Knapp-USGS).
W71-08579

GROUNDWATER IRRIGATION IN THE TIRASPOL' DISTRICT OF MOLDAVIA (RUSSIAN: OROSHENIYE PODZEMNYMI VODAMI V TIRASPOL' SKOM RAYONE MOLDAVII),
For primary bibliographic entry see Field 02F.
W71-08582

TELEVISION - A NEW TOOL FOR THE GROUNDWATER GEOLOGIST,
Geological Survey, Washington, D.C.
J. T. Callahan, R. L. Wait, and M. J. McCollum.
Ground Water, Vol 1, No 4, p 4-6, Oct 1963. 9 fig.

Descriptors: *Water wells, Casing, Screens, Drilling, Lithology, Aquifer characteristics, Groundwater, Rock properties.
Identifiers: *Television, 'Subaqueous' geologic studies, Drilling characteristics.

The television camera has become a tool of the groundwater geologist, enabling him to examine visually the inside of a well deep below the land surface. Using the camera, the rocks can be viewed in place. Of great importance to the groundwater studies in coastal Georgia, the camera enables the geologist to see the important water-bearing zones in a limestone aquifer, and to recognize cracks and solution cavities, the changes in geologic formations, and the irregularities in the well bore that indicate the relative hardness of the rocks. The engineer, well driller, and water developer can examine a well when 'trouble shooting' to see whether the casing is broken, whether screens are eroded, or whether the well contains obstructions. (Campbell-NWWA)
W71-08815

HOW TO COMPLETE WATER SOURCE WELLS,
Marathon Oil Co., Regina (Saskatchewan).
For primary bibliographic entry see Field 08A.
W71-08830

VOLUME OF SNOWMELT INTERCEPTED BY LOGGING ROADS,
Southern Forest Experiment Station, Oxford, Miss.
Edward R. Burroughs, Jr., Michael A. Marsden, and Harold F. Haupt.
ASCE National Water Resources Engineering Meeting, Phoenix, Arizona, Jan 11-15, 1971. Preprint 1326. 23 p.

Descriptors: *Snowpacks, *Snowmelt, *Runoff, *Lumbering, Overland flow, Interception, Mountains, Watersheds (Basins), Melt water, Snow management, Idaho, Montana.
Identifiers: *Shallow subsurface flow, Interface flow, Lochsa River headwaters.

During an average snowpack season at high elevation in the Bitterroot Mountains of Montana and Idaho (a) the daily hydrograph for melt water collected in a roadway follows the classical diurnal pattern of high daytime and very low nighttime flow; (b) a larger portion of the daily volume seeps from the roadbank as shallow subsurface flow while a smaller portion flows directly over the ground surface beneath the snowpack; and (c) the daily combined volume of flow can be of considerable magnitude in terms of acre-feet.
W71-08848

USE OF RADIOISOTOPES IN TRACING RESERVOIR LEAKAGE AT ANCHOR DAM,
Bureau of Reclamation, Denver, Colo. Chemical Engineering Branch.
For primary bibliographic entry see Field 08B.
W71-08863

THE TEXAS WATER DEVELOPMENT BOARD COOPERATIVE STUDIES OF THE OGALLALA UNDERGROUND RESERVOIR,
Texas Water Development Board, Austin. Groundwater Div.
For primary bibliographic entry see Field 02F.
W71-08895

APPLICATION OF SURFACE PRESSURE TO ASSIST WATER RECHARGE INTO THE OGALLALA FORMATION,
Texas Tech Univ., Lubbock. Dept. of Petroleum Engineering.
Philip Johnson.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 193-204, 1970. 12 p, 8 fig.

Descriptors: *Groundwater recharge, *Injection wells, *Aquifers, *Texas, Water management (Applied), Recharge, Permeability, Water wells, Groundwater movement, Water levels, Water storage, Water yeild, Hydrogeology.
Identifiers: *Ogallala aquifer (Texas).

Large volumes of water may be stored in the dewatered zones of the Ogallala aquifer in Texas and may be retained in the vicinity of recharge for a reasonable period of time to permit local usage. Costs to recharge the Ogallala aquifer with playa water or imported water are reasonable with modern pumping equipment. Rapid disposal of playa lake water permits maximum utilization of the land for farm use. Sustained high flow rates into a recharge well may be obtained by application of pump pressure at the surface. Estimated costs to drill and equip a recharge well with a turbine sump pump and electric power equipment capable of injecting 1700 GPM at 50 psig pressure total $3,969. (See also W71-08349 thru W71-08357 and W71-08570 thru W71-08575) (Knapp-USGS)
W71-08896

RECHARGING THE OGALLALA FORMATION USING SHALLOW HOLES,
Texas Tech Univ., Lubbock. Dept. of Agricultural Engineering.
Marvin J. Dvoracek, and Sam H. Peterson.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 205-218, 1970. 14 p, 7 fig, 1 tab, 15 ref.

Descriptors: *Groundwater recharge, *Injection wells, *Aquifers, *Texas, Water management (Applied), Recharge, Permeability, Water wells, Groundwater movement, Water levels, Water storage, Water yield, Hydrogeology.
Identifiers: *Ogallala Aquifer (Texas).

More than fifteen acre-feet of runoff water has been recharged into the Ogallala aquifer of Texas by means of a shallow hole. During this period increased in rate of recharge were observed. A condition of soil piping is responsible for the increasing rates and disposition of the cavity material. By soil piping, the more water recharged the greater the channel sizes become, accommodating more water and more sediment. In conclusion, recharge by this method has proven to be an effective means of artificially recharging the Ogallala Formation in the area of the test. (See also W71-08349 thru W71-08357 and W71-08570 thru W71-08575) (Knapp-USGS)
W71-08897

GROUNDWATER CONDITIONS IN THE HARQUAHALA PLAINS, MARICOPA AND YUMA COUNTIES, ARIZONA,
Geological Survey, Phoenix, Ariz.
E. E. Denis.
Arizona Land Department Water Resources Report, No 45, Apr 1971. 44 p, 7 fig, 2 plate, 4 tab, 7 ref, append.

Descriptors: *Groundwater, *Irrigation wells, *Hydrologic data, *Data collections, *Arizona, Aquifer characteristics, Water yield, Withdrawal, Aquifers, Water quality, Chemical analysis, Hydrogeology, Water wells, Water levels, Drawdown, Irrigation, Agriculture, Crops, Reviews.
Identifiers: *Groundwater resources, *Maricopa County (Ariz), *Yuma County (Ariz), *Harquahala Plains (Ariz), Drillers logs.

The climate in the Harquahala Plains in Arizona is arid, and precipitation is inadequate for raising crops; therefore, the groundwater reservoir is the only dependable source of water for irrigation. The first large irrigation well was drilled in 1951. In December 1966, 39,500 acres were under cultivation, and about 120 irrigation wells were in use. Most of the cultivated land is in the southeastern part of the area. The principal water-bearing strata are the sand and gravel units in the alluvium that underlies the plains. From December 1963 to December 1966, the water level declined as much as 50 feet. During this time about 3.7 million acre-feet of sediments was dewatered as a result of the withdrawal of about 560,000 acre-feet of groundwater. These data indicate a storage coefficient of about 0.15 for the aquifer. About 7.4 million acre-feet of water is available for withdrawal from the groundwater reservoir in the southeastern part of the Harquahala Plains. Chemical analyses indicate that the dissolved-solids content of the water ranges from about 500 to more than 1,000 mg/l. (Woodard-USGS)
W71-08900

PROJECTED GROUNDWATER DEFICIENCIES IN NORTHEASTERN ILLINOIS, 1980-2020,
Illinois State Water Survey, Urbana.
R. J. Schicht, and Allen Moench.
Illinois Water Survey Circular 101, 1971. 22 p, 10 fig, 3 tab, 11 ref.

Descriptors: *Water demand, *Water supply, *Water shortage, *Groundwater mining, *Illinois, Safe yield, Water yield, Aquifers, Water resources development, Overdraft, Water utilization, Withdrawal, Forecasting, Groundwater.
Identifiers: *Chicago (Ill).

Future groundwater demands for each township in the Chicago Region were estimated for each 10-year interval from 1980 to 2020. Relationships were found between population and per capita consumption and between manufacturing employment and per capita consumption. Estimates of demand were made on the basis of these relationships. Groundwater resources are developed from two aquifer systems. Future demands were compared with the available groundwater resource for each township, and maps were prepared showing areas of groundwater deficiency. When limiting groundwater withdrawals to recharge, a large number of townships will require importation of water by as early as 1980. By continued mining, three townships in northern Cook County will require importation by 1990. Large areas will require importation by 2020 with either approach. It is possible there is sufficient water in storage in the deeper aquifers to meet groundwater demands through 2020. (Knapp-USGS)
W71-08906

THE YIELD OF WATER WELLS.
Universal Oil Products, St. Paul, Minn. Johnson Div.

U.O.P. Johnson Division Bulletin No. 1238, Revised February, 1962, 8 p., 5 fig.

Descriptors: *Water wells, *Sepcific yield, Drawdown, Hydraulic gradient, Screens.
Identifiers: *Head loss, Well design factors, Well discharge formulas, Well diameter effects, Well spacing, Yield-drawdown relations.

The potential capacity of a water-bearing sand o sand-gravel formation to yield water is governe primarily by the permeability, extent and thickne of the formation. Development of the full yieldin capacity of the aquifer by the construction o screened wells depends on the depth of penetr tion, screen design, drawdown, method of develo ment and to a limited extent on well diamete There are other technical details of ground wat hydraulics and hydrology that might be discusse However, the presentation of the fundamental pri ciples in this bulletin will serve as a reliable gui for choosing the various elements of the well stru ture to get the desired end results -- maximum yie and efficient operation. (Campbell-NWWA)
W71-08923

4C. Effects on Water of Man's Non-Water Activities

THE NATIONAL HYDROLOGIC BENC MARK NETWORK,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07A.
W71-08327

A STUDY OF RESOURCE USE IN URBANIZI WATERSHEDS,
Harvard Univ., Cambridge, Mass. Dept. of La scape Architecture.
Peter Rogers, and Carl Steinitz.
Available from the National Technical Informat Service as AD-719 311, $3.00 in paper copy, $0 in microfiche. Corps of Engineers Plan Formu tion and Evaluation StudiesEnvironmental Anal Contract Report No 2, June 1970.

Descriptors: *City planning, *Urbanization, * vironmental affects, *Watersheds, Mathemat models, Drainage systems, Water pollution riv River basins, Landscaping.
Identifiers: Urban hydrology.

The report describes a simulation model c structed to enable planners to evaluate quickly damaging impact of urbanization (and chan land uses) on the run-off characteristics of a r basin. The model area involves a small part of Charles River Basin, Massachusetts. It also d with visual consequences of urbanization u waterways which flow through the developing a
W71-08513

SPACE-TIME VALIDATION OF A TH DERSTORM RAINFALL MODEL,
Arizona Univ., Tucson. Dept. of Water Management.
For primary bibliographic entry see Field 02B.
W71-08530

STREAM SEDIMENT: AN ENVIRONMEN PROBLEM,
Geological Survey, Washington, D.C. W Resources Div.
George E. Ferguson, and Harold P. Guy.
Journal of Soil and Water Conservation, Vo No 6, p 217-221, Nov-Dec 1970. 3 tab, 2 fi ref.

Descriptors: *Sediment transport, *Sediment trol, Road construction, Costs, Urbanization, sion control, Construction.
Identifiers: *James River Basin, Interstate Com sion on the Potomac River Basin.

Although the problem of sediment runoff is a one, people have been aroused recently becau

the awareness of the effects of sediment runoff from urban construction sites. The authors describe the program for sediment control developed in the Washington metropolitan region. The authors suggest that more research needs to be done on this problem and explain that the cost of protecting denuded surfaces at construction sites in high-cost land areas 'appears to be within reason.' (Holmes-Rutgers)
W71-08821

EROSION AND SEDIMENTATION FOLLOWING ROAD CONSTRUCTION AND TIMBER HARVEST ON UNSTABLE SOILS IN THREE SMALL WESTERN OREGON WATERSHEDS,
Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg.
R. L. Fredriksen.
USDA Forest Serv Res Pap PNW-104. 15 p.

Descriptors: *Clearcutting, *Road construction, Sedimentation rates, Sediment yield, Bed Load, Suspended load, Soil stability, Soil erosion, Landslides, Oregon, Pacific Northwest US.
Identifiers: *Experimental watersheds, Humid temperature climate, Forest roads.

In two steep headwater drainages, landslides were the predominant source of increased sedimentation of streams following timber harvest. Patch-cut logging with forest roads increased sedimentation compared with a control by more than 100 times over a 9-year period. Landslide erosion was greatest where roads crossed high gradient stream channels. In an adjacent clearcut watershed with no roads, sedimentation increased three times that of the control.
W71-08851

TERRAIN AND COVER EFFECTS ON SNOWMELT IN A WESTERN WHITE PINE FOREST,
Intermountain Forest and Range Exp Station, Logan, Utah.
L. E. Packer.
Forest Science, Vol 17, No 1, p 125-134, Mar 1971.

Descriptors: *Ablation, *Snowmelt, *Canopy, Elevation, *Slopes, *Clearcutting, Forest management, Snow management, White pine trees, Solar radiation, Idaho.
Identifiers: *Terain, *Aspect, Basal area, Cumulative diameter.

Whether increases in snowpack water that result from cutting timber in western white pine (Pinus monticola Dougl.) forests of the northern Rocky Mountains can create flood-producing conditions depends, in part, upon the melting behavior of the snowpack under various terrain and forest conditions. Reported are results of a 4-year study which show that snowmelt (ablation) rates are influenced significantly by differences in terrain and forest cover conditions. Differences in elevation, aspect, slope steepness, and forest cover accounted for 74 percent of the variance in snowmelt rate. Forest managers can exert some control over snowmelt rates by choosing the terrain and forest cover conditions suitable for specific forest management practices. Clearcutting of the most dense forest stands on southerly aspects at low to intermediate elevations provides largest increases in snowmelt rates. Partial cutting of timber on northerly aspects at intermediate to high elevations affords the best opportunity to effect reductions in snowmelt rates. (Packer-USFS)
W71-08854

D. Watershed Protection

EFFECT OF LAND USE ON THE HYDROLOGY OF SMALL WATERSHEDS IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, La Crosse, Wis.
For primary bibliographic entry see Field 04A.
W71-08839

IMPROVING SURVIVAL OF ALKALI SACATON SEEDLINGS UNDER ADVERSE CONDITIONS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
For primary bibliographic entry see Field 02I.
W71-08850

EROSION AND SEDIMENTATION FOLLOWING ROAD CONSTRUCTION AND TIMBER HARVEST ON UNSTABLE SOILS IN THREE SMALL WESTERN OREGON WATERSHEDS,
Pacific Northwest Forest and Range Experiment Station, Corvallis, Oreg.
For primary bibliographic entry see Field 04C.
W71-08851

FERTILIZERS FOR BULLET-PLANTED LOBLOLLY PINES,
Southern Forest Experiment Station, Oxford, Miss.
Paul D. Duffy.
Mississippi Farm Research, Vol 33, No 7, p 1, 5, July 1970.

Descriptors: *Fertilization, *Loblolly pine trees, *Nutrient requirements, Growth rates, Root development, Nitrogen, Phosphorus, Potassium, Erosion control, Reforestation, Mississippi.
Identifiers: *Containerized planting, *Tree planting, *Forest fertilization, Afforestation.

A solution containing nitrogen, phosphorus, and potassium applied to soil around 9-week-old loblolly pines in plastic bullet-shaped containers significantly increased top and root growth during the first 9 weeks after a simulated outplanting. These increases in initial growth should aid establishment of container plantings being tested as means to establish erosion control plantings.
W71-08855

SHEET EROSION ON INTERMOUNTAIN SUMMER RANGES,
Intermountain Forest and Range Experiment Station, Ogden, Utah.
Richard O. Meeuwig.
USDA Forest Serv Res Pap INT-85. 25 p.

Descriptors: *Sheet erosion, *Vegetation effects, *Soil properties, Simulated rainfall, Soil texture, Organic matter, Wettability, Range management, Slope stability, Soil stability, Soil density, Soil aggregates, Soil moisture, Impact (Rainfall), Estimating equations, Utah.
Identifiers: *Slope gradient.

Simulated rain was applied to small plots on seven mountain range land sites in Utah, Idaho, and Montana. Multiple regression equations were developed for each site relating the resultant erosion to cover characteristics, soil properties, and slope gradient. The magnitude of erosion was found to depend primarily on the proportion of the soil surface protected from direct raindrop impact by plants, litter, and--in some cases-- stone. Soil organic matter favored stability of fine-textured soils, but apparently increased erodibility of sandy soils. The regression equations are presented in tabular and nomographic form to aid the land manager in the assessment of potential sheet erosion on sites similar to those studied.
W71-08856

WEEPING LOVEGRASS FOR VEGETATING STRIP-MINE SPOILS IN APPALACHIA,
Northeastern Forest Experiment Station, Berea, Ky.
For primary bibliographic entry see Field 05G.
W71-08857

SITE REHABILITATION UNDER PLANTED REDCEDAR AND PINE,
Southern Forest Experiment Station, Oxford, Miss.
D. C. McClurkin.
In: Tree Growth and Forest Soils, p 339-345, 1970. Proc, Third North American Forest Soils Conf, 1968, Raleigh, NC.

Descriptors: *Erosion control, *Land reclamation, *Infiltration, Soil physics, Soil chemistry, Soil chemical properties, Soil analysis, Vegetation effects, Humus, Porosity, Mississippi.
Identifiers: *Site rehabilitation, Liter accumulation, Water transmission rates, Mississippi.

The study compares long-term changes in the physical and chemical properties of soil and litter on eroded old fields planted to pure stands of redcedar, loblolly pine, shortleaf pine, and mixtures of redcedar with loblolly and redcedar with shortleaf to determine which species or species combination rehabilitated the site most rapidly. Litter accumulation under pure stands of pine was more than twice as deep and three to four times as heavy as that under pure redcedar. Water transmission was three to five times faster under the pure pines than under the pure redcedar. Under shortleaf, the litter contained more nitrogen and calcium and the soil contained more organic matter than under loblolly pine. However, loblolly produced more litter than did shortleaf and water transmission was more rapid beneath it. Thus, of the two pines, loblolly appears to be superior for site protection and rehabilitation.
W71-08859

FOREST FLOOR CHARACTERISTICS IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, St. Paul, Minn.
M. Dean Knighton.
USDA Forest Serv Res Note NC-102. 2 p.

Descriptors: *Humus, *Soil compaction, Grazing, Soil surfaces, Watershed management, Soil properties, Soil formation, Soil erosion, Land reclamation, Pasture management, Wisconsin.
Identifiers: *Humus variability, *Humus development, Coulee Experimental Forest.

Percent slope, aspect, topographic position, and crown closure were found to have no significant influence on forest floor depth in southwestern Wisconsin. However, a significant decrease in forest floor depth from 8.5 to 6.7 cm. and an increase in soil compaction were found on currently grazed slopes. Yet when grazing is stopped recovery is apparently quick with no permanent damage.
W71-08860

CONTAINERIZED PINES FOR ERODED WATERSHEDS,
Southern Forest Experiment Station, Oxford, Miss.
D. C. McClurkin.
Journal of Soil and Water Conservation, Vol 26, No 1, p 25-26, 1971.

Descriptors: *Forest management, *Reforestation, Erosion control, Pine trees, Plastics, Soil stabilization, Slope stabilization, Fertilization, Reclamation, Germination, Mississippi.
Identifiers: Containerized planting, Polypropylene tubing, Peat pellets, Polystyrene bullets, Seedling survival, Eroded watersheds, Planting practices.

Containerized planting appears feasible for revegetating eroded sites and extending the current planting season into the summer. In a designed study of polypropylene tubing, peat pellets, and polystyrene 'bullets,' seedlings outplanted in pellets consistently survived better than those in tubes or bullets; tubes and bullets were about equally effective. The superior performance of seedlings in pellets may be due more to the fertilizer added to pellets during their manufacture than to the container. Addition of fertilizers to soil in bullets produced dramatic increases in seedling height growth and root development in a greenhouse study. If techniques such as fertilization of the potting soil can consistently improve field survival and growth

and if planting devices can be installed on light vehicles designed for difficult terrain, containerized planting should make rehabilitation of southern watersheds far easier.
W71-08861

EVALUATING WATERSHED MANAGEMENT ALTERNATIVES,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
Harry E. Brown.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 97, No IR-1, Paper 7952, p 93-108, Mar 1971. 16 p, 7 fig, 6 tab, 20 ref.

Descriptors: *Watershed management, *Water resources development, *Reviews, *Arizona, Projects, Evaluation, Irrigation, Surface waters, Water yield, Vegetation effects, Sedimentation, Erosion control, Forestry, Wildlife, Clear-cutting, Runoff, Agriculture, Cattle.
Identifiers: *Beaver Creek (Ariz).

On the Beaver Creek Pilot Project in Arizona evaluations are made of watershed management designed to increase water yield. There have been modest gains in cattle forage following cabling Utah juniper and felling alligator juniper, but these are offset by complete loss of wood production. Water and sediment yields are unchanged, and wildlife effects are uncertain. There were substantial gains in water production and forage for cattle and wildlife following clear-cutting ponderosa pine, but there were large losses in terms of wood, aesthetics, and sedimentation. A more refined pine treatment, where one-third of a watershed was cleared in 60-foot strips, has been completed for 1 yr. There are indications of increased water, herbage, and wildlife yields from this treatment. Losses in the other values have been less than with clearcutting. (Woodard-USGS)
W71-08915

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

WATER RESOURCES DATA FOR COLORADO, 1969: PART 2. WATER QUALITY RECORDS.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W71-08324

MERCURY IN THE ENVIRONMENT--SURFICIAL MATERIALS OF THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
Hansford T. Shacklette, Josephine G. Boerngen, and Robert L. Turner.
Free on application to the US Geological Survey, Washington, DC, 20242. Geological Survey Circular 644, 1971. 5 p, 1 fig, 1 tab, 10 ref.

Descriptors: *Pollutants, *Heavy metals, *Soil chemical properties, *Environmental effects, *United States, Ecology, Earth materials, Environment, Soils, Chemical analysis, Sampling, Data collections, Distribution patterns, Path of pollutants, Histograms.
Identifiers: *Mercury, *Mercury pollution.

Mercury determinations for 912 samples of soils and other regoliths from sites approximately 50 miles apart throughout the United States are represented on a map by symbols showing five ranges of concentration. A histogram of mercury concentrations in the samples is also given. The geometric mean concentration of mercury is 71 parts per billion for all samples, 96 ppb for samples from the Eastern United States, and 55 ppb for samples from Western United States. Twelve samples contained at least 1,000 ppb mercury; the greatest concentration found was 4,600 ppb. (Woodard-USGS)
W71-08326

DETECTION OF OIL SLICK POLLUTION ON WATER SURFACES WITH MICROWAVE RADIOMETER SYSTEMS,
Microwave Sensor Systems, Inc., Downey, Calif.; and California Univ., Santa Barbara.
J. C. Aukland, W. H. Conway, and N. K. Sanders.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 2, p 789-796, 1970. 8 p, 5 fig, 5 ref.

Descriptors: *Pollutant identification, *Water pollution sources, *Oil-water interfaces, *Remote sensing, *Microwaves, Oceanography, Radio waves, Aircraft, Water temperature, Surface waters, Radiation, Tracking.
Identifiers: *Oil slick tracking, *Microwave radiometry.

Two mechanisms by which the presence of oil on a water surface may be detected are discussed. Both of these mechanisms create an apparent temperature anomaly when oil is present. It is the presence of this local anomaly in the relatively uniform background of the sea surface that will signify the detection of oil pollution. An analytical basis for the mechanisms was developed, and the results of the experimental verification are presented. The first phenomena is concerned with measuring the local change in sea state due to the presence of the oil pollution. This phenomena presents very strong signals to microwave radiometers when winds of 6 knots or more are blowing. This is a primary detection mechanism for thin oil films. The second mechanism is the direct change in the emissivity of the water surface due to the presence of oil. This phenomena is slightly the weaker of the two, but offers the promise of measuring oil thickness. Because of the independence of these two potential detection mechanisms they are described separately. (Woodard-USGS)
W71-08361

MULTISPECTRAL SENSING OF OIL POLLUTION,
Michigan Univ., Ann Arbor.
D. S. Lowe, and P. G. Hasell.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 2, p 755-765, 1970. 11 p, 6 fig, 2 ref.

Descriptors: *Oily water, *Oceans, *Water pollution sources, *Tracking techniques, *Remote sensing, Aircraft, Photography, Pacific Ocean, Methodology, Surface waters.
Identifiers: *Oil spill, *Oil slick, Santa Barbara (Calif).

The Santa Barbara oil spill of 1969 offered an excellent opportunity to observe and map large scale oil pollution in a natural setting. The University of Michigan conducted multispectral flights over the slick in early March. Imagery made from selected spectral bands extending from the ultraviolet through the thermal infrared are presented. Imagery from an early morning flight shows the slick best contrasted in the UV and thermal infrared and not detectable in the photo-infrared. (Woodard-USGS)
W71-08363

CHEMICAL CHARACTERISTICS OF ORGANIC COLOR IN WATER,
Washington, Univ., Seattle, Dept. of Civil Engineering.
Russell F. Cristman, Masahisa Nakamura, and Warren Williams.
Available from the National Technical Information Service as PB-199 707, $3.00 in paper copy, $0.95 in microfiche. Final Report 16020DKW 09/70, 93 p, 42 fig, 15 ref. FWQA Grant No WP-EF-01031.

Descriptors: *Color, *Computer programs, Least squares method, Mathematical model, Data processing, Sampling, Solubility, Adsorption, Hydrogen ion concentration, Volumetric analysis, Colorimetry, Colloids, Coagulation, Chemical precipitation.
Identifiers: Electrical charge, Jar tests, Graphs, Transmission, Total organic carbon, Hydrogen ion concentration meter.

The colloid charge titration technique described by Kawamura and Tanaka, was used to measure the charge on color-aluminum, color-thorium, and color-lanthanum dispersions. This method was able to measure the charge on colloids which were too small to be seen, thus replacing the Briggs microelectrophoresis cell technique. Tests were conducted using a Lumetron Model 402E filter photometer to obtain data points of pH vs % transmission; and pH vs total organic carbon. A computer program was designed to perform a least squares analysis on all the data points to determine the shape of the curve, and the curves were then plotted on a plotter. The program which was developed will analyze as many as 15 sets of data. Analyses made on data taken from actual colored influent will provide operators with plots which show the optimum operating conditions for a particular color removal problem. (Lowry-Texas)
W71-08396

WATER QUALITY STUDY OF THE POPLAR RIVER, DOUGLAS COUNTY, WISCONSIN TRIBUTARY TO LAKE SUPERIOR,
Wisconsin State Univ., Superior. Dept. of Chemistry; and Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05B.
W71-08495

DISTRIBUTION OF SELECTED METALS IN BOTTOM SEDIMENTS,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 05B.
W71-08497

ROLE OF MICROORGANISMS GROWING ON OIL IN THE SELF-CLEANING AND INDICATION OF OIL POLLUTION IN THE SEA,
O. G. Mironov.
Available from the National Technical Information Service as JPRS 52491, $3.00 in paper copy, $0.95 in microfiche. Translated from: Okeanologiya, V 10, No 5, p 820-827, 1970, JPRS-52491, Feb 197 12 p, 3 fig, 17 ref.

Descriptors: *Oil, *Oil wastes, Oily water, *Indicators, *Water pollution sources.
Identifiers: *Biodeterioration, Oxidation, Black Sea, Indian Ocean, Marine microorganisms, Hydrocarbons, Peptones, USSR, Translations.

The microorganisms isolated from the water of the Black Sea and Indian Ocean can grow on oil and oil products, using them as the only source of carbon and energy. This fact suggests a possible oxidation of oil products that occur in the sea. However, the vast majority of hydrocarbon-oxidizing microorganisms show an ability to grow not only on hydrocarbons but also on other carbon sources, e.g. on peptones. Therefore, when hydrocarbon and non-hydrocarbon sources of carbon, specifically oil and sewage, co-occur in the sea, the self-cleaning of organic sewage components from the sea area will be more rapid than the rate of decomposition in the sea water. A close correlation between the presence of hydrocarbon-oxidizing microorganisms and oil pollution of sea water provides a logical basis for regarding the group of bacteria as an oil pollution indicator.
W71-08503

MERCURY ANALYSES AND TOXICITY REVIEW,
Teledyne Brown Engineering, Huntsville, Ala. Environmental Sciences; and Carnegie-Mellon U Pittsburgh, Pa.

r primary bibliographic entry see Field 05C.
71-08517

TIONAL SYMPOSIUM ON DATA AND IN-RUMENTATION FOR WATER QUALITY ANAGEMENT.

rrigan, James E., Editor. Available from Water sources Center, Hydraulics and Sanitary Lab, iv of Wisconsin, Madison, Wis, 53706, Price 00. Proceedings of the National Symposium on ta and Instrumentation for Water Quality nagement, Conference of State Sanitary En-eers and Wisconsin University, July 21-23, 0, Madison, Wis, 1970. 521 p. OWRR Project 99-WIS (13).

scriptors: *Data processing, *Data collections, ata storage and retrieval, *Water quality con-, *Conferences, Water pollution control, Moni-ng, Hydrologic data, Flood forecasting, Digital nputers, Systems analysis, Simulation analysis, nputer programs.
ntifiers: *Water quality data.

National Symposium on Data and Instrumen-on for Water Quality Management was held at University of Wisconsin in Madison, Wisconsin, uly 21-23, 1970, under the joint sponsorship of Conference of State Sanitary Engineers and the consin Water Resources Center, with sixteen fessional societies as cosponsors. The central ne of the 43 papers in the Symposium was to as-the benefits offered by advanced data collec-, analysis and display systems toward the ancement of the nation's environment. (See W71-08551 thru W71-08569) (Knapp-USGS) 1-08550

TER QUALITY INFORMATION SYSTEMS, E KEY TO CLEANER WATERS,
nsylvania Dept. of Health, Harrisburg. Bureau anitary Engineering.
ter A. Lyon.
ceedings of the National Symposium on Data Instrumentation for Water Quality Manage-t, Conference of State Sanitary Engineers and consin University, July 21-23, 1970, Madison, p 2-7, 1970. 6 p.

criptors: *Water quality, *Monitoring, *Water ution control, *Data collections, *Data essing, Pennsylvania, Conferences, Reviews, er resources research act.
tifiers: *Water quality information systems.

present state of water quality information ms is poor. The shortest response time een the recognition of pollution problems in a r water body and its solution is between fifteen twenty years. Adequate forecasting systems ld shorten this response time to prevent in-n degradation. Most of the nation's waters are ted because of this long response time. As a t of a research and development grant from Federal Water Quality Administration, the sylvania Department of Health is in the ess of developing a Water Quality Manage-Information System, designed to show how a can, to the fullest extent, develop such a m and base its operations on the utilization of a system. The first year of the grant has just concluded and two major modules of the prehensive system, a water quality module and ilities module have been designed and pro-med. (See also W71-08550) (Knapp-USGS) -08551

RDINATION - THE KEY TO EFFECTIVE ER DATA MANAGEMENT,
ogical Survey, Washington, D.C. Office of r Data Coordination.
Langford, and W. W. Doyel.
eedings of the National Symposium on Data Instrumentation for Water Quality Manage-, Conference of State Sanitary Engineers and onsin University, July 21-23, 1970, Madison, p 8-32, 1970. 25 p, 11 fig.

Descriptors: *Hydrologic data, *Data collections, *Data storage and retrieval, *Data processing, Management, Planning, Water resources research act, Governments, Federal government, Inter-agency cooperation, Conferences, Reviews.
Identifiers: *Water data management, Office of Water Data Coordination.

Although there are large quantities of water data being acquired in the United States and large amounts of money being spent on that acquisition and the subsequent handling, the data are not fully utilized, nor are they always acquired at the proper place or at the proper time. The cost of acquiring the data increases as part of the general increase in the cost of doing any type of activity. Therefore, in order to give the data user the date he needs in the format in which he needs them and in the time frame in which he requires them, it is necessary to fully coordinate data acquisition activities. Thus, by lumping needs, preparing a unified acquisition program and entering the resultant data in a data handling system, maximum use can be made of a minimum amount of data. Within the Federal establishment coordination procedures now are being tested. (See also W71-08550) (Knapp-USGS)
W71-08552

BASIC DATA REQUIREMENTS TO EVALUATE WATER POLLUTION IN QUALITY CONTROL PROGRAMS,
NUS Corp., Pittsburgh, Pa. Cyrus William Rice Div.
Paul V. Morgan.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 33-56, 1970. 24 p, 6 tab, 4 ref.

Descriptors: *Monitoring, *Water pollution control, *Reviews, *Water quality, *Water Quality Act, Instrumentation, Programs, Governments, Data collections, Hydrologic data, Management, Planning, Federal government, Inter-agency cooperation, Conferences.
Identifiers: *Water quality data.

The effective conduct of a national pollution control program requires that reliable information on water quality be collected, analyzed, and evaluated in a timely and efficient manner. The real progress during the last decade has been in the number and variety of applications of automatic water quality monitoring equipment throughout the country by a variety of federal, state, and interstate agencies, and private groups. There are quite a number of industrial plants utilizing monitors in major effluent streams. The Federal Water Pollution Control Act amendments in 1961, the Water Quality Act of 1965, the Clean Water Restoration Act of 1966, the Water Quality Improvement Act of 1969, the Federal Water Pollution Control Act of 1970 continued the ever-increasing involvement of the federal government in water pollution control which had previously been allocated to the states. See also W71-08550) (Knapp-USGS)
W71-08553

A SYSTEMS APPROACH TO WATER QUALITY DATA MANAGEMENT,
Price Waterhouse and Co., Philadelphia, Pa. Management Advisory Services.
George B. Murdock.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 57-75, 1970. 19 p, 7 ref.

Descriptors: *Systems analysis, *Monitoring, *Water pollution control, *Reviews, *Water quality, *Water quality act, Instrumentation, Programs, Governments, Data collections, Hydrologic data, Management, Planning, Federal government, Inter-agency cooperation, Conferences.
Identifiers: *Water quality data.

Review of the literature reveals that pollution control and other environmental quality problems are complex enough to be examined by means of the systems approach. The insights gained may lead to better solutions. With the advent of modern systems techniques, increasing interest in them has been shown by federal, state, and local governments and other decision making bodies. A water quality management information system will greatly enhance the speed and precision with which decisions may be made in the water quality management field, and thereby increase the effectiveness of the program as a whole. The Commonwealth of Pennsylvania is developing new water quality management techniques by applying modern systems concepts to a state program. This project has been supported and financed, in part, by the Federal Water Quality Administration, Department of the Interior, pursuant to the Federal Water Pollution Control Act. It is intended that this project will develop uniform systems techniques applicable to other states' water pollution control programs. (See also W71-08550) (Knapp-USGS)
W71-08554

LESSONS TO BE LEARNED WHEN COLLECTING VALID DATA,
Manhattan Coll., Bronx, N.Y. Dept. of Civil Engineering.
Robert V. Thomann.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 76-86, 1970. 11 p, 5 fig, 1 ref.

Descriptors: *Data collections, *Hydrologic data, *Water quality, Monitoring, Model studies, Water pollution control, Reviews, Conferences, Mathematical models, Systems analysis.
Identifiers: *Water quality data.

The validity of data involves the uses that are made of the information that is collected for water quality studies. In addition, the validity of data is determined by (1) conditions of sampling, (2) accuracy of the measurement of the sample, and (3) the time-space variability of the systems that are being sampled. The uses to which data are being put must be analyzed carefully so that a meaningful sample collection program can be devised. Cognizance must be taken of the expected response times of systems, the order of magnitude of the response times, and load and water quality variability, all of which determine the space and time details of the sample collection program. (See also W71-08550) (Knapp-USGS)
W71-08555

EXPERIENCES WITH AUTOMATION IN REMOTE SAMPLING AND ANALYSIS OF SURFACE WATERS,
American Chain and Cable Co., Glen Cove, N.Y. Bristol Datamaster Div.
L. P. Sill, Jr.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 87-98, 1970. 12 p, 4 fig.

Descriptors: *Telemetry, *Monitoring, *Water quality, *Water pollution control, *Illinois, Reviews, Conferences, Sampling, Data collections, Hydrologic data, Canals, Sewage treatment, Storm runoff.
Identifiers: *Chicago (Ill), *Water quality data.

The Chicago Sanitary District covers 850 square miles and provides water and sewage facilities for a population of 5.5 million plus an industrial load equivalent to an additional 3 million people. It maintains 71 miles of inland water ways. The plan uses an installed and fully operational integrated Data Acquisition System to monitor water quality of the water ways and point the way to the most efficient methods of the pollution abatement. The system consists of eleven monitoring stations, three

secondary receiving stations, and one central receiving station. Each monitoring station telemeters its sampling data to one secondary station and to the central station. The secondary stations are located at each of the major sewage treatment works which discharge effluent to the water ways. Because of the location of the monitoring stations, each treatment plant knows the quality of water entering the system, the condition of the effluent discharges, and the quality of the water leaving its system. (See also W71-08550) (Knapp-USGS)
W71-08556

FORECASTING OF WATER QUALITY DATA IN THE DELAWARE RIVER ESTUARY,
Delaware River Basin Commission, Trenton, N.J.
Peter K. MacEwen, and Richard C. Tortoriello.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 99-123, 1970. 25 p, 19 fig, 1 tab, 5 ref.

Descriptors: *Mathematical models, *Delaware River, *Delaware River Basin Commission, *Monitoring, *Dissolved oxygen, Reviews, Conferences, Streamflow, Sewage, Water quality, Water pollution control, Data collections, Hydrologic data, Sampling.
Identifiers: *Water quality data.

A mathematical model of both steady-state and the time-varying water quality was developed for the Delaware Estuary. The model demonstrates the cause-and-effect relationship between oxygen demanding waste material, both carbonaceous and nitrogenous, and the resulting DO level in the Estuary. The water quality models are realistic predictors of both dissolved oxygen and salinity for years 1964 and 1968, under different conditions of waste loading and stream flows. In establishing water quality effluent standards for industries and municipalities, the steady-state model was used to determine the cause-effect relationship between stream DO and the waste load discharged to the Estuary. Use of such a model permitted the investigation of various alternatives of waste treatment in the Estuary and the resulting effects on the river. (See also W71-08550) (Knapp-USGS)
W71-08557

NEED FOR WATER QUALITY DATA IN PLANNING WATER RESOURCE DEVELOPMENTS,
Geological Survey, Lincoln, Nebr. Water Resources Div.
Lester R. Petri.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 125-129, 1970. 5 p.

Descriptors: *Data collections, *Data processing, *Hydrologic data, *Water quality, Monitoring, Water resources development, Planning, Reviews, Conferences, Analytical techniques, Statistical methods.
Identifiers: *Water quality data.

Water quality data needed in planning may be separated into two categories: (1) basic data, and (2) interpretive data. Basic data are those obtained by direct measurement of the resource itself or of the environment in which the resource is found. Interpretive data are those derived by analysis of basic data. They may be statistical indices such as means, modes, or coefficients of correlation. A program must consider the fact that important changes in water quality sometimes take place gradually and cannot easily be detected with short-term records. Also, the proper range of conditions to be sampled cannot be depended upon to occur in any given year. Therefore, operation of the program must be on a continuing basis so that data representing long-term conditions will be available when they are needed. A carefully designed program identifies the kinds of measurements most likely to be needed and provides for their collection. Provisions in the program must be made to review periodically the data being collected for its intrinsic value. (See also W71-08550) (Knapp-USGS)
W71-08558

DATA NEEDS IN ENGINEERING DESIGN,
Datagraphics, Allision Park, Pa.
Henry C. Bramer.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 130-136, 1970. 7 p.

Descriptors: *Data collections, *Hydrologic data, *Planning, *Monitoring, *Water pollution control, Costs, Water quality, Abatement, Water quality control, Water quality act.
Identifiers: *Water quality data.

This review of data needs is directed to those specifically usable for engineering design purposes, on the basis that facilities are constructed to maintain specified water quality levels required by the uses to be made of receiving streams, and that such objectives are to be realized in the most generally cost-effective means possible. The total engineering effort includes the engineering input of the regulatory agencies as well as that of the design engineer. As mathematical modeling techniques applicable to the prediction of water quality in stream, to process design, and to cost estimation become more sophisticated, the practical uses of water quality information will increase. These techniques allow the engineer to comprehensively weigh alternatives so as to define the most cost effective. (See also W71-08550) (Knapp-USGS)
W71-08559

NEED FOR WATER QUALITY DATA IN OPERATING WATER IMPOUNDMENTS,
Bureau of Reclamation, Washington, D.C. Div. of Water and Land Operations.
Maurice N. Langley.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 137-144, 1970. 8 p.

Descriptors: *Water quality control, *Reservoir operation, *Data collections, *Monitoring, Water utilization, Reservoir stages, Lake morphometry, Hydrologic data, Water storage, Water pollution sources.
Identifiers: *Water quality data.

The need for water quality data in operating water impoundments is governed largely by the characteristics of the inflows; the location, size, depth, and configuration of the impoundment; the activities of man on the water and shorelines; the direct multiple uses of the impoundment; and the downstream purposes for which the water is to be used. A regular monitoring program of input, in storage, and downstream water quality characteristics, coupled with knowledge of the effects of water quality on the multiple purposes that an impoundment is to serve, can assist greatly in maximizing benefits. Such data will serve to point up at an early stage the development of undesirable reservoir characteristics. (See also W71-08550) (Knapp-USGS)
W71-08560

PYROGRAPHIC GROSS CHARACTERIZATION AND MONITORING OF WATER POLLUTANTS,
Rocketdyne, Athens, Ga. Southeast Field Lab.
Ihor Lysyj.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 145-159, 1970. 15 p, 4 fig, 6 ref. FWQA Contract No 14-12-802.

Descriptors: *Water analysis, *Monitoring, *Wate pollution control, *Data collections, *Analytica techniques, Gas chromatography, Chromatog raphy, Pollutant identification, Data processin Computers.
Identifiers: *Pyrolysis.

A design of a prototype instrumental system for th performance of pyrographic water-quality analys and the development of procedures for the inte face of instrumental hardware and computer sof ware for a fully integrated and automatic sequen of chemical analysis, data acquisition, data redu tion and the computation of results are discusse Using this technique it is possible to determine t degree of pollution in a given waterway quantit tively and to determine the relative contributions each waste discharging source to the total polluti load of the river. The pyrographic analysis of downstream sample permits calculation of the to pollution load of the river at that point, and the c culation of the percent contributions of vario dischargers to such a pollution load. (See a W71-08550) (Knapp-USGS)
W71-08561

APPLICATION OF REMOTE SENSING T WATER QUALITY MANAGEMENT,
Ecology and Environment, Inc., West Seneca, Y.
G. Strobel, and F. Silvestro.
Proceedings of the National Symposium on D and Instrumentation for Water Quality Mana ment, Conference of State Sanitary Engineers a Wisconsin University, July 21-23, 1970, Madis Wis., p 160-165, 1970. 6 p, 1 fig, 4 ref.

Descriptors: *Remote sensing, *Monitori *Water quality, *Data collections, *Water po tion control, Solar radiation, Aerial photograp Photometry, Spectroscopy.
Identifiers: *Water quality data.

Due to the size of the bodies of water and the w distribution of waste outfalls that must be mo tored, an approach utilizing quantitative rem sensing technology including spectral photogra and visible and infrared scan systems will allow cient gathering of the required data. Basic these systems optically gather sunlight that is s tered or reflected by the pollutant. Spectral ph graphic techniques allow categorizations of w quality including estimates of algae concentrat Suspended solids concentration of a water co can be quantified to about 1 ppm. The source the discharge is grossly classified using the spe reflectance curve. (See also W71-08550) (Kn USGS)
W71-08562

FUNDAMENTALS OF SYSTEMS DESIGN,
Geological Survey, Washington, D.C.
Charles R. Showen.
Proceedings of the National Symposium on and Instrumentation for Water Quality Man ment, Conference of State Sanitary Engineers Wisconsin University, July 21-23, 1970, Mad Wis, p 177-182, 1970. 6 p, 5 ref.

Descriptors: *Data collections, *Data proces *Data transmission, *Hydrologic data, *Netw Telemetry, Statistics, Monitoring, Water qu Water quality control.
Identifiers: *Water quality data, *Data sy design.

System design has a vital role in the establish of an efficient data handling system. Careful a sis, inventiveness, and ingenuity by the design have a definite impact on the effectiveness system. The complexity of the system is depe upon the user demands of the system. The required to design and implement a small s

be only a few months, while the time required design an elaborate systen can take many nths or several years. As systems become larger l more interrelated, users will need standardiza- to ease communication and formatting blems so that transfer of data between the tems is more easily achieved. (See also W71-50) (Knapp-USGS)
1-08564

GANIZING A DATA COLLECTION PRO-AM,
eau of Reclamation, Sacramento, Calif.
Martin Roche.
ceedings of the National Symposium on Data Instrumentation for Water Quality Manage-nt, Conference of State Sanitary Engineers and consin University, July 21-23, 1970, Maidson, p 183-191, 1970. 9 p, 1 fig.

criptors: *Data collections, *Data processing, ta transmission, *Hydrologic data, *Networks, emetry, Statistics, Monitoring, Water quality, ter quality control.
ntifiers: *Water quality data, *Data systems gn.

California, several state and federal agencies k together in organizing a water quality data ection program. By using a coordinated ap-ach and by maintaining contact throughout the gram, men and equipment can be efficiently l, duplicated efforts can be avoided, costs can ninimized, and accurate, consistent data can be ined. The U. S. Bureau of Reclamation's Water lity Surveillance Program in the San Francisco -Delta Estuary is an excellent example of a perative study. The Delta plays a key role in the eau's Central Valley Project and in California's e Water Project, as it serves as the collection export point for water stored in reservvoirs in hern California. Water is released from storage is pumped from the Delta channels to be sent canals to agricultural lands in the semiarid San quin Valley. Data collection for the program is ied out under the supervision of the Bureau relations of results using different methods of ysis are made so that the results can be placed a common basis. (See also W71-08550) (K-p-USGS)
1-08565

MPATIBILITY OF SYSTEMS AND IN-RCHANGE OF DATA,
logical Survey, Washington, D.C. Water ources Div.
vin D. Edwards.
ceedings of the National Symposium on Data Instrumentation for Water Quality Manage-t, Conference of State Sanitary Engineers and consin University, July 21-23, 1970, Madison, p 192-197, 1970. 6 p.

criptors: *Computer programs, *Data storage retrieval, *Data processing, *Data collections, drologic data, Water quality, Digital compu- Telemetry, Statistics, Networks, Planning, iews.
tifiers: *Water quality data, *U. S. Geological ey.

ommon exchange of ideas and techniques veen users in the analysis and design of new r quality data systems can contribute much rd increased compatibility between systems. U. S. Geological Survey's Water Resources sion has greatly increased the compatibility of oftware systems by implementing procedures he bilingual interfacing of computer languages. example, a computer procedure written in the TRAN IV language can now be used as a outine within a procedure written in the PL/1 uage. This has allowed the Division to greatly nd its use of existing internal and external edures with only a minimal amount of modifi-n to the original source. The Water Resources sion now has the advantage of using existing, large-scale and standardized statistical packages and processing procedures available in the computer library of the U. S. Geological Survey for the analysis and meaningful reduction of its data. (See also W71-08550) (Knapp-USGS)
W71-08566

EXPERIENCES WITH A WATER POLLUTION CONTROL STORAGE AND RETRIEVAL SYSTEM (STORET),
Federal Water Quality Administration, Washington, D. C. Pollution Surveillance Branch.
Phillip L. Taylor.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 198-207, 1970. 10 p, 7 fig.

Descriptors: *Computer programs, *Data storage and retrieval, *Data processing, *Data collections, *Hydrologic data, Water quality, Digital computers, Telemetry, Statistics, Networks, Planning, Reviews.
Identifiers: *Water quality data, *STORET system.

Water pollution control data related to the nation's 3,500,000 miles of flowing streams, over 12,000 miles of general coastline and more than 65,000 square miles of inland open waters are extensive in amounts and varieties. Computers are capable of accepting vast amounts and varieties of data with similar ability to feed back selected information. The Federal Water Quality Administration's STORET System is used primarily for the handling of water quality data. The addition of a variety of remote teleprocessing devices, digitization, and digital plotting applications to the system, and the use of microfilm, all together, represent an extensive system application. With use of remote terminals, particularly low speed types, both digital and CRT, field personnel at any location can have access to data and other information to meet day-to-day needs, thus facilitating the operation of a responsive water pollution control program. (See also W71-08550) (Knapp-USGS)
W71-08567

EXPERIENCE WITH STORAGE AND RETRIEVAL OF GROUNDWATER DATA,
Geological Survey, Washington, D. C. Water Resources Div.
L. G. Moore.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers, and Wisconsin University, July 21-23, 1970, Madison, Wis, p 208-213, 1970. 6 p.

Descriptors: *Computer programs, *Data storage and retrieval, *Data processing, *Data collections, *Hydrologic data, Water quality, Digital computers, Telemetry, Statistics, Networks, Planning, Reviews.
Identifiers: *Water quality data, *U. S. Geological Survey.

The Water Resources Division of the U. S. Geological Survey has been utilizing the present punch card system for the storage and retrieval of groundwater data for the past six years. Further automation of the Division's historical file was accomplished by the creation of a central data file. To gain greater efficiency in handling the data, the system was divided into three main data bases: well inventory data, quality of water data, and water level data. The well inventory data base describes the geological and hydrologic characteristics and the physical features of the well. The quality of water data base contains the basic chemical analysis and radiochemical data. The water level data base contains descriptive material and the water levels observed in the well. (See also W71-08550) (Knapp-USGS)
W71-08568

A WATER QUALITY STORAGE AND RETRIEVAL SYSTEM FOR REGIONAL APPLICATION,
Texas A and M Univ., College Station.
Roy W. Hann, Jr., and Ted M. Sparr.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 214-222, 1970. 9 p, 2 fig.

Descriptors: *Computer programs, *Data storage and retrieval, *Data processing, *Data collections, *Hydrologic data, Water quality, Digital computers, Telemetry, Statistics, Networks, Planning, Reviews.
Identifiers: *Water quality data, *U. S. Geological Survey.

Data storage and retrieval systems are briefly reviewed. Basically, any scheme for saving data and selectively recalling it later qualified as a storage and retrieval system, whether or not a computer is involved. A computerized data management system may be defined as a set of programs which manages the data base. A list of these management activities commonly includes: data base creation; file maintenance; selective retrieval; and support of high-level file description and retrieval languages used to direct system activities. (See also W71-08550) (Knapp-USGS)
W71-08569

THE HIGH RESOLUTION NMR SPECTRA OF PESTICIDES, I. ORGANOPHOSPHORUS PESTICIDES,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
Lawrence H. Keith, Arthur W. Garrison, and Ann L. Alford.
Journal of the Association of Official Analytical Chemists, Vol 51, No 5, p 1063-1094, Sept 1968. 10 fig, 3 tab, 22 ref. EPA Project No 16020 EWC.

Descriptors: *Pesticides, *Nuclear Magnetic Resonance, *Organophosphorus pesticides, Data Collections, Spectroscopy, *Pollutant identification, Analytical techniques.
Identifiers: Chemical shifts, Coupling constants, Spin decoupling.

A description of the 100 MHz nuclear magnetic resonance spectra of 40 organophosphorus pesticides is presented with a list of their chemical shifts and coupling constants. The more complex or unusual spectra are reproduced and discussed. Tables of trends in chemical shifts are reproduced and discussed. Tables of trends in chemical shifts and coupling constants as related to structure are included. (See also W71-08587 thru W71-08590) (Alford-EPA-Southeast Water Laboratory)
W71-08586

THE HIGH RESOLUTION NMR SPECTRA OF PESTICIDES, II. THE DDT-TYPE COMPOUNDS,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
Lawrence H. Keith, Ann L. Alford, and Arthur W. Garrison.
Journal of the Association of Official Analytical Chemists, Vol 52, No 5, p 1074-1092, Sept 1969. 7 fig, 3 tab, 18 ref. EPA Project No 16020 EWC.

Descriptors: *Pesticides, *Nuclear Magnetic Resonance, *DDT, Data collections, Spectroscopy, *Pollutant identification, Analytical techniques.
Identifiers: Chemical shifts, Coupling constants, Spin decoupling.

The 100 MHz nuclear magnetic resonance spectra of the DDT class of pesticides and related compounds are discussed. Various substituents affect the resonances of the aromatic protons. The CCl sub 3 moiety on the alpha-carbon strongly deshields the ortho protons on the aromatic rings, and this deshielding effect is greatly enhanced by

substitution of a chlorine ortho rather than para on the aromatic ring. These deshielding effects are explained by considering the substituent electronegativity and the molecular stereochemistry. Chemical shifts and coupling constants are tabulated. (See also W71-08586 and W71-08588) (Keith-EPA-Southeast Water Laboratory)
W71-08587

THE HIGH RESOLUTION NMR SPECTRA OF PESTICIDES, THE CARBAMATES,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
Lawrence H. Keith, and Ann L. Alford.
Journal of the Association of Official Analytical Chemists, Vol 53, No 1, p 157-179, Jan 1970. 8 fig, 3 tab, 11 ref. EPA Project No 16020 EWC.

Descriptors: *Pesticides, *Nuclear magnetic resonance, *Carbamate pesticides, *Thiocarbamate pesticides, Data collections, Spectroscopy, *Pollutant identification, Analytical techniques.
Identifiers: Chemical shifts, Coupling constants, Spin decoupling.

The 100 MHz nuclear magnetic resonance spectra of 35 carbamate pesticides and a major metabolite of one pesticide are discussed. Chemical shifts and coupling constants are tabulated, and reproductions of the more complex or unusual spectra are included. A concentration and solvent dependence of both the NH-proton and the NCH3-proton resonances of an N-monosubstituted carbamate is discussed. Hindered rotation is observed in the N,N-dimethylcarbamates, the thiolcarbamates, and the dithiocarbamates, but not in the N-methylcarbamates. (See also W71-08586 and W71-08587) (Alford-EPA-Southeast Water Laboratory)
W71-08588

SUPPLEMENTARY INTERPRETATIONS OF THE NMR SPECTRA OF PHOSPHORUS PESTICIDES,
Federal Water Pollution Administration, Athens, Ga. Southeast Water Lab.
Lawrence H. Keith, and Ann L. Alford.
Analytica Chimica Acta, Vol 44, p 447-448, 1969. 2 ref. EPA Project No 16020 EWC.

Descriptors: *Pesticides, *Nuclear Magnetic Resonance, *Organophosphorus pesticides, Spectroscopy, *Pollutant identification, Analytical techniques.
Identifiers: Chemical shifts, Coupling constants, Spin decoupling.

A brief comparison of the interpretations of the 100-MHz organophosphorus pesticide NMR spectra with the 60-MHz data previously reported by other researchers illustrates the benefits of high resolution and homonuclear decoupling. (See also W71-08586) (Alford-EPA-Southeast Water Laboratory)
W71-08589

REVIEW OF THE APPLICATION OF NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY IN PESTICIDE ANALYSIS,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
Lawrence H. Keith, and Ann L. Alford.
Journal of the Association of Official Analytical Chemists, Vol 53, No 5, p 1018-1035, Sept 1970. 1 fig, 47 ref. EPA Project No 16020 EWC.

Descriptors: *Pesticides, *Nuclear Magnetic Resonance, Data collection, *Pollutant identification, Analytical techniques.
Identifiers: Chemical shifts, Coupling constants, Pesticide residue analysis, Pesticide metabolites, Pesticide photolysis.

This review included all references to July 1970, where NMR spectroscopy has been used for structural elucidation of pesticide metabolites and degradation products, for structural confirmation of new pesticides, or for product analysis of existing ones. (See also W71-08586 thru W71-08589) (Alford-EPA-Southeast Water Laboratory)
W71-08590

ACCUMULATION OF DDT RESIDUES IN TRIPHOTURUS MEXICANUS FROM THE GULF OF CALIFORNIA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 05C.
W71-08601

RECOGNITION OF BUNKER OILS BY THIN-LAYER CHROMATOGRAPHY,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
J. C. Sipos, R. G. Ackman, and R. F. Addison.
Fisheries Research Board of Canada, New Series Circular No 37, May 6, 1970. 6 p, 5 fig.

Descriptors: *Chromatography, *Oil, *Analytical techniques, *Pollutant identification, *Water analysis, Chemical analysis, Oil water, Oil wastes, Indicators, Tracers, Laboratory tests, On-site data collections, On-site tests.
Identifiers: *Thin-layer chromatography, *Oil pollution, *Bunker oil.

Bunker oil contains several groups of 'aromatic' compound carbon skeletons. If these groups could be recognized and proportions estimated, it would be possible to examine oil slicks or beach deposits and compare the oil with samples from suspected ships or other sources, and to examine animal life for bunker oil packup. Compounds of this type, with one or two insignificant exceptions, are not normally found in marine plants or animals. A procedure simple enough for field use is described. (LeGore-Washington)
W71-08608

A CONSTANT FLOW DELIVERY DEVICE FOR CHRONIC BIOASSAY,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 05C.
W71-08618

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT (DEC. 1, 1970 TO MARCH 1, 1971),
New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 05C.
W71-08649

RADIOCARBON IN THE SEA,
Washington Univ., Seattle.
A. C. Fairhill, R. W. Buddenmeier, I. C. Yang, and A. W. Young.
HASL-242, April 1, 1971, p I35-I78, 7 fig, 4 tab, 25 ref. AEC Contract No AT (45-1)-2091.

Descriptors: *Carbon radioisotopes, *Nuclear explosions, *Ocean circulation, *Carbon dioxide, Equilibrium, Atmosphere, Oceans, Geophysics, Vertical migration, Oceanography, Sampling, Radioactivity techniques.

Of the world inventory of natural carbon-14, about 51 metric tons, over 90% is in the oceans. Atmospheric nuclear testing increased the supply about 3%. Some 2/3 of the increase has already been transferred to the oceans, an amount sufficient to increase the carbon-14 of the upper 150 m by 25%. Evidence of bomb carbon-14 was shown in the upper few hundred meters of most ocean areas, to 700 meters in some areas, and to 3600 meters in the North Atlantic. The experimental method included stripping on board ship 60 liter seawater samples of carbon dioxide which were sent to a laboratory for counting. (See also W71-08649) (Bopp-ORNL)
W71-08650

CONCENTRATION OF TRACE ELEMENTS IN ENVIRONMENTAL SAMPLES WITH A CENTRIFUGAL CONTRACTOR,
Du Pont de Nemours (E. I,) and Co., Aiken, S. C. Savannah River Lab.
R. C. Milham, and D. W. Hayes, and F. E. Butler.
Health Physics, Vol. 20, No. 1, p 91-3, 1971.

Descriptors: *Zinc radioisotopes, *Water analysis, *Radiochemical analysis, Environmental effects, Trace elements, Separation techniques, Neutron activation analysis, Spectroscopy.
Identifiers: Extraction.

The centrifugal contractor is suitable for a variety of extraction processes. By contractor modification, organic extractants with densities greater than water can be used. The contractor can also be used for concentrating trace organic material in suitable solvents. It is also applicable to traces of stable nuclides which are first concentrated and then analyzed by standard analytical methods such as neutron activation, atomic absorption, etc. (Bopp-ORNL)
W71-08651

GAS CHROMATOGRAPHIC ANALYSIS OF TOXAPHENE IN NATURAL WATERS, FISH AND LAKE SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Lab.
Robert A. Hughes, Gilman D. Veith, and G. Fred Lee.
Water Research, Vol 4, p 547-558, 1970. 5 fig, 1 tab, 15 ref.

Descriptors: *Gas chromatography, *Analysis, *Chlorinated hydrocarbon pesticides, Fish, Lakes, Sediments, Wisconsin, Suspended load, Plankton, Colorimetry, Diffusion, Sampling, Chromatography.
Identifiers: *Cleanup procedures, Toxaphene, Pesticide analysis, Planimetry, Organic interference, Florisil.

The rate of toxaphene, used in Wisconsin for rough fish control, was investigated to determine if water quality parameters could be linked to successful treatment, to evaluate the role of lake sediments in detoxification of toxaphene, and to assess effects of persistent toxaphene residues on restocked fish. The established procedures for removal of chemical interferences from samples for analysis needed modification or supplementary cleanup steps to cope with the organic interferences present in aquatic samples: for example, solids from vegetative sources in water and suspended solids; fats and oils from fish. Special procedures were developed for water, suspended solids, net plankton, fish and sediment. Presence of toxaphene was verified by thin-layer chromatography. Substances which interfered with the electron-capture gas chromatographic quantitation of toxaphene were removed from sample extracts by column chromatography on Florisil, magnesium oxide, alumina and a Celite, either alone or in combinations. Since each lake system requires specific procedures to cope with the intereferences present in each body of water, samples were obtained before the toxaphene treatment. Efficiency of procedures depends on quantity and character of organic material present. (Jones-Wisconsin)
W71-08681

BIOGEOCHEMISTRY OF A RESERVOIR ECOSYSTEM,
Oklahoma State Univ., Stillwater. Dept. of Chemistry; and Oklahoma State Univ., Stillwater. Dept. of Zoology; and Oklahoma State Univ., Stillwater. Reservoir Research Center.
Louis P. Varga, Dale W. Toetz, and Troy C. Dorris.
Available from the National Technical Information Service as ORO-2070-3, $3.00 in paper copy, $0.95 in microfiche. Oklahoma State Univ., Stillwater, Reservoir Research Center Report No. 3, 1970. 13 p, 3 fig, 3 ref.

Descriptors: *Analytical techniques, *Reservoirs, *Nitrate, *Mathematical models, Compu

ctivity, Instrumentation, Water quality, toring, Digital computers, Analog computers, collections.
fiers: *Keystone Reservoir (Okla), *Continu- lata acquisition, Nutrient flux, Nitrate as- tion, Biogeochemistry.

ry goals are development of instrumentation echniques for determination of physical and cal properties in natural water systems with asis on research that will contribute to im- d water quality. 'Second generation' equip- is described, including a schematic diagram e Keystone Reservoir monitoring system. g output from probes is measured by an model 801 digital millivolt meter. Digital from meter is coupled to a Teletype model 11 paper tape punch via a Hewlett-Packard 2545 punch coupling system and special translating interface. Field evaluation of a ype floating sampling station is described. ation of ion-selective electrodes and labora- valuation is given. Modeling nitrate dynamics ted uniquely slow rate of nitrate assimilation. -Wisconsin)
08685

SANITATION SITUATION OF THE NE COASTAL WATERS OF NORTH SAR- IN RELATION TO INDUSTRIAL POLLU- AND URBAN SEWAGE, (SITUAZIONE ICIA DELLE A CQUE MARINE IERE DEL NORD-SARDEGNA IN RAP- O ALL' INGUINAMENTO INDUSTRIALE NARIO-URBANO),
i Univ. (Italy). Instituto di Igiena.
imary bibliographic entry see Field 05B.
08723

ENIC SITUATION OF SARDINIAN TAL WATERS,
ri Univ. (Italy). Instituto di Igiena.
imary bibliographic entry see Field 05B.
08724

STIGATIONS ON THE STATE OF POLLU- OF THE COASTAL WATERS OF THE AN PENINSULA, (ENQUETES SUR T DE POLLUTION DES EAUX ERES DE LA PENINSULE ITALIENNE),
a Univ. (Italy). Instituto Igiena.
imary bibliographic entry see Field 05B.
08725

IODS FOR SEPARATION OF BDEL- BRIO FROM MIXED BACTERIAL POPU- ON BY FILTRATION THROUGH MIL- RE FILTERS OR BY GRADIENT DIF- NTIAL CENTRIFUGATION,
w Univ., Jerusalem (Israel). Dept. of biological Chemistry.
Varon, and Moshe Shilo.
Internationale d'Oceanographie Medicale, d'Etudes et de Recherches de Biologie et nographie Medicale, Institut National de la et de la Recherche Medicale, Foundation de de Nice, Nice, Vols 18 and 19, 1970, p 145- 7 ref.

ptors: *Bacteria, *Separation techniques, tion, *Centrigugation, *Filters, Isolation, rification, Water purification, *Pollutant cation.
iers: *Bdellovibrio, Pseudomonas.

aluate the ecological importance of Bdel- o, the organisms had to be isolated from dif- natural environments and their abundance ted. Differential filtration of the sample h a membrane filter of 1.2 microns pore size antitation of attachment and penetration, ifferential centrifugation in linear ficol nts were performed. Eighty to ninety percent Bdellovibrios put on top of the gradient and ugated at 1620g for 20 minutes, were recovered in the upper 3.5 ml of the gradient column. These techniques indicate promise for future quantiative assays on the abundance of Bdellovibrios in nature. Methods for quantification of different sequential stages in the life cycle of Bdellovibrio such as attachment to the host cell, penetration in its periplasm and intracellular growth and multiplication is also considered. (Ensign-PAI)
W71-08729

FUNGUS PRODUCERS OF ANTIBIOTICS IN SEAWATER, (CHAMPIGNONS PRODUCTEURS D'ANTIBIOTIQUES DANS L'EAU DE MER),
Naples Univ. (Italy). Instituto di Igiena.
E. De Simone, E. Campanile, V. Ferro, R. De Fusco, and S. Grasso.
Revue Internationale d'Oceanographie Medicale, Dentre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Foundation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 125-129.

Descriptors: *Sea water, *Fungi, *Antibiotics, *Bioindicators, *Self purification, Pollutant identification, Water purification.

Ten years of research on the extraordinary disappearance of germ pathogens and indicators of fecal pollution in the littoral waters of Cuma, where physical, hydrological and meteorological conditions make dilution difficult, are reported. The biological factors which intervene in the self-purification of these waters, particularly the phenomenon of antipathy was examined. The antibiosis phenomenon has been thought not to take place in natural environments and in the presence of other microorganisms because there would be an infinite number of antibiotic-resistant strains. However, this study indicates that it is not impossible that the antibiotic-producing strains are capable of producing antibiotics in nature and in the presence of other microorganisms but their action is not manifested because they are destroyed very rapidly. (Ensign-PAI)
W71-08731

OIL POLLUTION DETECTION AND DISCRIMINATION BY REMOTE SENSING TECHNIQUES,
Spectran, Inc., Buena Park, Calif. Microwave Sensor Systems Div.
J. C. Aukland, and D. T. Trexler.
Available from the National Technical Information Service as AD-716 349, $3.00 in paper copy, $0.95 in microfiche. US Coast Guard Report No 714104/A/006-1, Washington, DC, Oct 1970. 166 p, 46 fig, 5 tab.

Descriptors: *Oil wastes, *Tracking techniques, *Remote sensing, *Aerial photography, *Cameras, *Infrared radiation, Temperature, Pollutant identification, Oily water.
Identifiers: Radiometer system specifications, Detection, Microwave radiometer temperatures.

Detection of oil pollution by using airborne remote sensing was performed in the Gulf of Mexico during April 1970. Number 2 fuel oil, number 6 fuel oil, 9250 lube oil, light crude oil, heavy crude oil, gasoline, and oil and gas mixtures were investigated. Two dual polarized microwave radiometers, an infrared scanner, a dual 70 mm camera and a 4-lens camera with filters from the mid-visible to ultraviolet wavelengths were used. (Ensign-PAI)
W71-08745

AERIAL PHOTOGRAPHIC STUDIES OF THE COASTAL WATERS OF NEW YORK AND LONG ISLAND,
Virginia Univ., Charlottesville. Dept. of Environmental Science; New York Univ., Bronx. Dept. of Biology.
Mahlon G. Kelly, and Louis Castiglione.
Available from the National Technical Information Service as AD-715 804, $3.00 in paper copy, $0.95 in microfiche. Nov 12, 1970. 52 p, 6 tab, 11 fig, 14 ref. USNOO Contract N62306-70-A-0073-0003.

Descriptors: *Coasts, *Aerial photography, *Photography, *Data collections, *Water analysis, *Benthos, Remote sensing, New York, Pollutant identification.
Identifiers: Photoenhancement, Photo interpretation, *Long Island (NY).

Results from aerial photographic studies of the coastal waters of New York and Long Island are presented. Appropriate aerial photographs of the test sites and photoenhancement for quantitative analysis of the images were acquired. Measurement of oceanographic parameters such as suspended material concentrations, particle analysis, phytoplankton composition, chlorophyll concentration, salinity and temperature; the examination of benthic conditions; and continuous sampling of a tidal interface were conducted. Analysis of particle and phytoplankton samples, mapping of benthic vegetation and reduction and interpretation of much of the data is incomplete. Sampling will continue in the Montauk Point, Chesepeake Bay, and Cape Hatteras areas for comparative studies. (Ensign-PAI)
W71-08746

MONITORING ECOLOGICAL CHANGES IN THE MARINE ENVIRONMENT,
Clapp (William F.) Labs., Inc., Duxbury, Mass.
Robert E. Hillman.
Preprint Ecological Problems in the Marine Environment, 1st National Biological Congress, American Institute of Biological Sciences and Federation of American Societies for Experimental Biology, p 33-43, November 10, 1970, 1 fig, 1 tab.

Descriptors: *Monitoring, *Environmental effects, *Oceans, *Mathematical models, *Ecosystems, Model studies, Biological communities, Control systems, Water pollution effects, Sampling, Data collections.

Many man-induced factors can produce relatively rapid changes in the marine environment. With increased uses of the marine environment, there is an increased need for effective monitoring of these changes. The problems are what to monitor, how to monitor, and how to analyze data. Mathematical simulation models are one solution to these problems of predicting ecological changes and population responses. Mathematical models can be grouped into statistical models or deterministic models, but to develop the top-echelon model for a marine ecosystem up to five categories of models may be needed: hydrodynamic (flow) model, chemical-quality model, temperature model, atmospheric model, and biological (ecological) model. A brief explanation of the requirements of each of the physical environment models is given. A thorough examination of the less developed biological modeling is presented, including a table listing the data acquisition steps for a biological model. Results and projections of top-echelon models demand the interpretations of experienced ecologists, and, when properly used, can provide the most efficient approach to problems of monitoring ecological change in the marine environment. (McEntyre-PAI)
W71-08766

PHYSICAL DATA POTOMAC RIVER TIDAL SYSTEM INCLUDING MATHEMATICAL MODEL SEGMENTATION,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Support Lab.
For primary bibliographic entry see Field 02L.
W71-08774

BIOLOGICAL AND OCEANOGRAPHICAL SURVEY OF THE SANTA BARBARA CHANNEL OIL SPILL 1969-1970, VOLUME I:

BIOLOGY AND BACTERIOLOGY; VOL II: PHYSICAL, CHEMICAL AND GEOLOGICAL STUDIES.
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08776

OBSERVATIONS ON THE ZOOPLANKTON OF THE EASTERN SANTA BARBARA CHANNEL FROM MAY, 1969 TO MARCH, 1970,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08779

THE BENTHIC FAUNA IN THE SANTA BARBARA CHANNEL FOLLOWING THE JANUARY, 1969, OIL SPILL,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08780

SOME POLYCHAETOUS ANNELIDS FROM THE SANTA BARBARA SHELF AREA,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08781

FECAL CONTAMINATION OF FRUITS AND VEGETABLES DURING CULTIVATION AND PROCESSING FOR MARKET, A REVIEW,
Environmental Protection Agency, Cincinnati, Ohio. Div. of Water Hygiene.
Edwin E. Geldreich, and Robert H. Bordner.
Journal of Milk and Food Technology, Vol 34, No 4, p 184-195, Apr 1971. 10 tab, 74 ref.

Descriptors: Water quality control, Water pollution sources, *Standards, *Public health, *Environmental sanitation, *Aquatic microbiology, Pathogenic microorganisms, Enteric bacteria, Salmonella, Adoption of practices, Irrigation water, Surface irrigation, Fruit crops, Vegetable crops, Soil contamination, Harvesting, Coliforms, *Pollutant identification, *Reviews.
Identifiers: *Fecal contamination, *Fecal coliforms, Microbiological methods, Raw vegetables, Produce handling.

Bacteriological data collected from various field studies involving irrigation water, field crops, and soils were studied with respect to sources and magnitude of fecal contamination associated with cultivation, harvesting, and marketing of fruits and vegetables. Other reports concerned with contamination during agricultural activities were reviewed. Fecal coliform densities proved to be a better measurement of the probable occurrence of waterborne pathogens than any single test for a specific pathogenic group. When the fecal coliform density per 100 ml was above 1,000 organisms in various stream waters, Salmonella occurrence reached almost 100 per cent frequency. These data support the establishment of the proposed limit of 1,000 fecal coliforms per 100 ml of irrigation water, but approved sanitation practices must accompany (or supplement) use of this bacteriological standard. A concept of multiple safeguards to limit the public health hazard associated with poor quality irrigation water, irrigation farming practices, and market preparation of produce is discussed from the microbiological viewpoint. (Geldreich-EPA)
W71-08826

PULP MILL OUTFALL ANALYSIS BY REMOTE SENSING TECHNIQUES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-08829

AN AERIAL PHOTOGRAPHIC STUDY OF WASTE FIELD FROM THREE OCEAN OUTFALLS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-08831

THE USE OF PHOTOGRAMMETRY IN PREDICTING OUTFALL DIFFUSION,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-08832

THE APPLICATION OF NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY TO PESTICIDE ANALYSES,
Environmental Protection Agency, Athens, Ga. Southwest Water Lab.
L. H. Keith, and A. L. Alford.
Varian Instrument Applications, Vol 5, No 1, Feb 1971, p 2-3. 7 ref.

Descriptors: *Nuclear magnetic resonance, *Pesticides, *Reviews, *Spectroscopy, Pollutant identification, Pesticide residues.
Identifiers: Pesticide metabolites, Pesticide photolysis products.

This review points out that NMR has been used successfully in pesticide analyses and supplies information difficult and sometimes impossible to obtain by other means. Applications listed are: pesticide residue analyses, elucidation of photolysis products, characterization of synthesized pesticide metabolites, studies of reaction and intermediate products, and structural elucidation of pesticides. Collections of pesticide spectra in the literature are listed. (See also W71-08834 thru W71-08836 and W71-08586 thru W71-08590) (Keith-EPA)
W71-08833

THE ENHANCEMENT OF ASYMMETRY EFFECTS IN NMR BY INTERMOLECULAR HYDROGEN BONDING,
Environmental Protection Agency, Athens, Ga. Southwest Water Lab.
A. W. Garrison, L. H. Keith, and A. L. Alford.
Spectrochimica Acta, Vol 25A, No 1, p 77-84 (1969).

Descriptors: *Nuclear magnetic resonance, *Organophosphorus compounds, *Hydrogen bonding, *Spectroscopy, Analytical techniques, Pollutant identification.
Identifiers: *Chemical shifts, *Coupling constants, Spin decoupling, Molecular asymmetry.

The doubling of the NMR signals of the isopropyl methyl protons in 2,4-dichlorophenyl methyl isopropylphosphoramidate has been shown to be due to a difference in chemical shift of the two methyl groups. This difference is ascribed to a steric hindrance to rotation about the N--C bond which enhances the inherent nonequivalence due to molecular asymmetry. Studies of the changes in chemical shift difference with changes in temperature, concentration and solvent show the steric hindrance to be due to intermolecular hydrogen bonding. The NMR data are correlated with infrared spectra of the phosphoramidate obtained under similar conditions; these spectra support the hydrogen bonding hypothesis. Possible hydrogen-bonded species are discussed. (See also W71-08833) (Garrison-GPA)
W71-08834

EU (DPM)3 TRANSANNULARLY INDUCED PARAMAGNETIC CHEMICAL SHIFTS IN THE PMR SPECTRA OF ENDRIN, DIELDRIN, AND PHOTODIELDRIN,
Environmental Protection Agency, Athens, Ga. Southwest Water Lab.
Lawrence H. Keith.
Tetrahedron Letters, No 1, 1971, p 3-6.

Descriptors: *Nuclear magnetic resonance, *Pes
cides, Dieldrin, Endrin, *Spectroscopy, Analytic
techniques, Pollutant identification.
Identifiers: *Chemical shifts, *Coupling constan
Spin decoupling, *Eu (DPM)3, Long-ran
coupling, Photodieldrin.

The PMR shift reagent Eu (DPM)3 was found u
ful for chemical shift and structural assignments
the epoxy derivatives of the chlorinated po
cyclodiene pesticides and their degradati
products. The stereochemistry of photodieldri
H-12, which migrates during photorearrangeme
was determined from a plot of the change of che
cal shift versus the distance cubed of each proto
the molecule. Numerous examples of the non-'
as well as normal 'W' long-range couplings w
observed. Presence of a transannular throu
space coupling of a bridgehead proton with
migrated proton in photodieldrin confirmed
stereochemical assignment made on the basis
shifts from the Eu (DPM)3. (See also W71-088
(Keith-EPA)
W71-08835

LONG-RANGE COUPLINGS IN T CHLORINATED POLYCYCLODIENE PES CIDES,
Environmental Protection Agency, Athens,
Southwest Water Lab.
Lawrence H. Keith, and Ann L. Alford.
Tetrahedron Letters, No 28, 1970, p 2489-2492

Descriptors: *Nuclear magnetic resonance, *P
cides, *Spectroscopy, Aldrin, Dieldrin, End
*Chlorinated hydrocarbon pesticides, Pollu
identification, Analytical techniques.
Identifiers: *Chemical shifts, *Coupling consta
Spin decoupling, Long-range coupling, Isodrin.

The NMR chemical shifts of the methylene pro
of the chlorinated polycyclodiene pesticides al
dieldrin, isodrin, and endrin were determine
decoupling experiments. NMR spectroscopy
found to be useful in differentiating between
exo-endo skeleton and the endo-endo skeleton
unusual long-range coupling between the C-4
C-5 protons and the syn methylene proton of
pounds containing either the exo-epoxide or th
—C double bond was noted. The exo-configura
of the epoxide oxygen in dieldrin was confir
(See also W71-08833) (Keith-EPA)
W71-08836

SENSORS - STATE-OF-THE-ART,
Geological Survey Washington, D.C
James H. Ficken.
Proceedings of the National Symposium on
and Instrumentation for Water Quality Ma
ment, Conference of State Sanitary Engineers
Wisconsin University, July 21-23, 1970, Mad
Wis, p 224-233, 1970. 10 p, 5 fig.

Descriptors: *Telemetry, *Data collec
*Water quality, *Monitoring, *Instrument
Hydrogen ion concentration, Electrical
ductance, Water temperature, Oxidation-redu
potential, Dissolved oxygen, Turbidity, Chlo
Fluorides.
Identifiers: *Water quality sensors.

The water quality parameters most commonly
sured and recorded by the U. S. Geological S
are electrical conductivity, temperature, pH
dissolved oxygen. Parameters less frequently
tored include turbidity, oxidation-reduction p
tial, chloride, and fluoride. This paper des
briefly some types of sensors now in use by
S. Geological Survey for monitoring the
quality in lakes, streams, and reservoirs. (Se
W71-08550) (Knapp-USGS)
W71-08872

TELEMETRY - STATE-OF-THE-ART,
Geological Survey, Washington, D.C.
George F. Smoot.

eedings of the National Symposium on Data Instrumentation for Water Quality Manage-, Conference of State Sanitary Engineers and onsin University, July 21-23, 1970, Madison, 234-242, 1970. 9 p, 1 fig.

iptors: *Telemetry, *Data collections, er quality, Monitoring, *Instrumentation, ogen ion concentration, Electrical con-nce, Water temperature, Oxidation-reduction tial, Dissolved oxygen, Turbidity, Chlorides, ides.
fiers: *Water quality sensors.

are many choices available for designing a etering system, and the decision as to which is atisfactory depends upon the specific need of er. However, because needs and programs for quality management are still evolving, any oring system should offer easy expansion as ements change, and the flexibility to be con-l to a more sophisticated system. With this ap-h, one can gain experience with a basic n, and expand as required. (See also W71-) (Knapp-USGS)
08873

GN OF AN AUTOMATIC MONITORING EM,
gical Survey, Austin, Tex. Water Resources

F. Blakey.
edings of the National Symposium on Data nstrumentation for Water Quality Manage-Conference of State Sanitary Engineers and nsin University, July 21-23, 1970, Madison, 243-247, 1970. 5 p, 4 ref.

ptors: *Telemetry, *Data collections, r quality, *Monitoring, *Instrumentation, gen ion concentration, Electrical con-nce, Water temperature, Oxidation-reduction ial, Dissolved oxygen, Turbidity, Chlorides, des.
iers: *Water quality sensors.

ovide the required data as soon as possible, . S. Geological Survey continuously tests, tes, and applies modern analytical tools and aches. One of the most important analytical dopted by the Survey in recent years is the atic water quality monitor. This paper oes the development, design, and operation h units. The Survey presently has some 300 quality monitors in operation, including 125 arameter potentiometric systems, 150 re-e-type units, and about 30 analog strip chart ors. The single most important factor in or operations is trained field personnel. The 's training program includes individual in-on in all phases of monitor installation and ion. The reliability of monitoring equipment dually improving. The Survey installs, es, and improves monitors as the need for ncreases and as the state-of-the-art allows. so W71-08550) (Knapp-USGS)
8874

RIENCES WITH OPERATING AN AUTO-C WATER QUALITY MONITORING EM IN AN ESTUARINE ENVIRONMENT,
l Water Quality Administration, Edison, udson-Delaware Basins Office.
W. Bromberg, and Manuel Carames.
dings of the National Symposium on Data strumentation for Water Quality Manage-Conference of State Sanitary Engineers and nsin University, July 21-23, 1970, Madison, 248-255, 1970. 8 p, 2 fig, 1 ref.

ptors: *Telemetry, *Data collections, r quality, *Monitoring, *Instrumentation, gen ion concentration, Electrical con-ce, Water temperature, Oxidation-reduction al, Dissolved oxygen, Turbidity, Chlorides, des.
iers: *Water quality sensors.

Since 1963 the Federal Water Quality Administration, Hudson-Delaware Basins Office, has operated a network of four automatic water quality monitors in the New York Harbor area. A fifth station was installed in late 1969. Water quality monitoring instrumentation was originally installed as a surveillance mechanism for two Federal Enforcement Conferences (Raritan Bay and Hudson River and New York Harbor) and is also providing vital historical data. Each monitor consists of a flow cell cubicle, an analyzer cubicle capable of holding eight parametric modules and a telemeter cubicle. Sample intake pumps are located at 5 feet above the bottom, mid-depth and 5 feet below the surface (mean tide level). On the average, valid water quality data are presently obtained 91% of the time. Of the 9% loss, approximately half is due to down time of the teletype lines, and the remainder is due to monitor equipment breakdown or malfunction. All monitoring stations are linked together in series with the central receiving station on a commercial leased teletype line. (See also W71-08550) (Knapp-USGS)
W71-08875

NEW YORK STATE AUTOMATIC WATER QUALITY MONITORING SYSTEM,
New York State Dept. of Health, Albany. Water Quality Surveillance Section.
Ronald E. Maylath.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 256-260, 1970. 5 p.

Descriptors: *Telemetry, *Data collections, *Water quality, *Monitoring, *Instrumentation, *New York, Hydrogen ion concentration, Electrical conductance, Water temperature, Oxidation-reduction potential, Dissolved oxygen, Turbidity, Chlorides, Fluorides.
Identifiers: *Water quality sensors.

The New York water quality surveillance network consists of approximately 200 active surface water sampling stations. The automatic monitoring system for New York's waters is designed to be highly reliable with a minimum of maintenance. The system consists of three basic parts: monitor, telemeter, and computer. Environmental parameter equipment measures pH, dissolved chlorides, dissolved oxygen, dissolved fluorides, conductivity, water temperature, turbidity, water stage height, solar radiation intensity, and air temperature. Environmental parameter alarms detect parameter values exceeding a preset limit and automatically collect a water sample. Functional command equipment allows remote control of various components in the monitor. (See also W71-08550) (Knapp-USGS)
W71-08876

AUTOMATED STREAM QUALITY SENSING NETWORK IN NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
Peter W. Anderson, John J. Murphy, and Samuel D. Faust.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 261-281, 1970. 21 p, 12 fig, 2 tab, 2 ref.

Descriptors: *Telemetry, *Data collections, *Water quality, *Monitoring, *Instrumentation, *New Jersey, Hydrogen ion concentration, Electrical conductance, Water temperature, Oxidation-reduction potential, Dissolved oxygen, Turbidity, Chlorides, Fluorides.
Identifiers: *Water quality sensors.

The automatic stream quality sensing network in New Jersey consists of ten stations located throughout the state. Four stations have two-parameter sensing units. The remaining stations are equipped with five-parameter units. Two of the five-parameter units are located at river confluences so that one instrument can record the water quality of two streams. The two-parameter unit measures specific conductance and water temperature. The package consists of a Fisher Porter automatic digital recorder (ADR), a Chelsea timer, a Beckman servo-programmer, and two sensors. The five-parameter unit measures specific conductance, water temperature, pH, turbidity, and dissolved oxygen. (See also W71-08550) (Knapp-USGS)
W71-08877

ERRORS TO AVOID IN WATER QUALITY COLLECTION AND SAMPLING,
Bureau of Reclamation, Sacramento, Calif.
Melvin Douglas Ball.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis., p 283-292, 1970. 10 p.

Descriptors: *Data collections, *Sampling, *Water quality, Monitoring, Data processing, Planning, Design, Hydrologic data, On-site tests, Analytical techniques, Calibrations, Instrumentation, Data storage and retrieval.
Identifiers: *Water quality data.

The collection of valid data from representative sampling sites is essential for every water quality data collection program. Time and effort spent collecting invalid or nonrepresentative data is wasted. Numerous environmental factors such as prevailing winds, flows, stratifications, water depths, waste discharges, tides, confluence of tributaries, seasons, and time of year must be examined and considered in the selection of sampling locations. Cross-sectional measurements should be conducted to determine the most representative sites. The special precautions required in collecting devices, containers, preservatives, and storage procedures used are reviewed. Instruments must always be properly calibrated, sufficiently powered, and used correctly. (See also W71-08550) (Knapp-USGS)
W71-08878

ERRORS TO AVOID IN COLLECTION AND SAMPLING,
Interstate Sanitation Commission, New York.
Thomas R. Glenn, Jr.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis., p 293-298, 1970. 6 p.

Descriptors: *Data collections, *Sampling, *Water quality, Monitoring, Data processing, Planning, Design, Hydrologic data, On-site tests, Analytical techniques, Calibrations, Instrumentation, Data storage and retrieval.
Identifiers: *Water quality data.

When any sampling program is undertaken, it is extremely important that the data be correct. If the data of a regulatory agency is to be used in court, highly experienced lawyers try to discount every procedure and analysis used by the regulatory agency. Therefore, good sampling, collection and analysis practices are a must. It is important that the sample be as homogeneous as is possible and that it be representative of the sampling point. In order to accomplish this, samples should be composited over a period of time to reduce the chance of abnormal instantaneous values. Also, if samples are not analyzed at the sampling site, they should be kept under conditions so as not to change their composition. In the case of BOD, refrigeration is suitable whereas for coliform determination (MPN's) refrigeration is not suitable but immediate planting is necessary. In setting up continuous monitoring equipment, it is important that the readings be representative of the areas and not just the point at which they are taken. Other problems

associated with continuous monitoring are those of calibration and maintenance and the manpower needed to keep the monitors properly maintained. (See also W71-08550) (Knapp-USGS)
W71-08879

HYDROBIOLOGICAL EVALUATION OF STREAM AND NEARSHORE SYSTEMS: FIELD STUDIES,
Michigan State Univ., East Lansing. Inst. of Water Research.
M. E. Stephenson, E. D. Anderson, and R. A. Cole.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis., p 299-309, 1970. 11 p, 3 fig, 1 tab.

Descriptors: *Monitoring, *Water quality, *Bioindicators, Sampling, Michigan, Water pollution effects, Pollutant identification, Thermal pollution, Lake Erie, Plankton, Aquatic life, Ecology, Aquatic environment.
Identifiers: *Water quality monitoring.

Hydrobiological evaluations may be conducted under the assumption that the most representative indicators of changing water quality are functions of the indigenous biological community. These responses may occur as a result of the introduction of foreign biological populations or change in physical and chemical properties. Field investigations were made on four Michigan stream systems and a nearshore environment in western Lake Erie to evaluate the response of these environments to urbanization and agriculture practices. An ecological evaluation of thermal discharge from a fossil fuel power plant at the mouth of the Raisin River in western Lake Erie was initiated in July, 1969. Community components elected to characterize changes are phytoplankton, periphyton, zooplankton, benthos, fish, and waterfowl. The physical and chemical parameters include temperature, oxygen, phosphorus, organic nitrogen, total nitrogen, nitrate, ammonia, organic carbon, and silica. In addition, pesticide analyses are being performed on the fish collected in the biological program. (See also W71-08550) (Knapp-USGS)
W71-08880

A NOTE ON SAMPLING IN WATER QUALITY STUDIES,
Federal Water Quality Administration, Edison, N. J.
Henry P. Shotwell.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis., p 310-312, 1970. 3 p.

Descriptors: *Sampling, *Data collections, *Water quality, *Statistical methods, Estimating, Heterogeneity, Homogeneity, Hydrologic data, Measurement, Reliability, Variability.
Identifiers: *Water quality data.

The type of water sample to be taken, and the proper sample size are discussed. If no advance information is available about the distribution, in the water, of the parameter or variable being studied, then a simple random sample is probably the best type to take. If the body of water being sampled is known to be heterogeneous, and this fact has a bearing on the parameter being studied, then a stratified random sample is indicated. In order to determine proper sample size, the desired confidence coefficient and confidence interval must be specified. In addition, some estimate of the population variance must be obtained, either from past experience or from a pilot study. Specifying a higher coefficient of confidence will also increase the required sample size, other things being equal. (See also W71-08550) (Knapp-USGS)
W71-08881

ON THE ANALYSIS AND USE OF WATER QUALITY DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
L. T. Fan, J. S. Shastry, and L. E. Erickson.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis., p 313-324, 1970. 12 p, 3 fig, 1 tab, 9 ref.

Descriptors: *Data collections, *Water quality, *Statistical methods, *Systems analysis, Time series analysis, Correlation analysis, Frequency analysis.
Identifiers: *Water quality data.

One of the primary reasons for water quality data collection is that of enforcement of water quality standards. Water quality data are also very useful to those investigating the ecology of streams and estuaries. Systems analysis techniques such as parameter estimation and spectral analysis may be used in the analysis of data and construction of models that enable the investigator to better understand the assimilative capacity of the stream and the effect of discharges on stream ecology. Water quality data may be collected continuously, periodically at frequent specified time intervals, or occasionally at infrequent time intervals. Spectral analysis requires a large volume of data at a very small sampling interval. The shortest period that is necessary to resolve determines the sampling interval, and the longest period necessary determines the total record length. (See also W71-08550) (Knapp-USGS)
W71-08882

ORGANIZING A DATA COLLECTION PROGRAM FOR WATER RESOURCES PLANNING, DEVELOPMENT AND MANAGEMENT,
Geological Survey, Washington, D.C.
D. W. Moody.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 325-335, 1970. 11 p, 1 fig, 1 tab, 5 ref.

Descriptors: *Systems analysis, *Data collections, *Sampling, *Monitoring, *Water quality, Statistics, Statistical methods, Planning, Water resources development, Frequency analysis, Mathematical models.
Identifiers: *Water quality data.

This paper examines the type of interaction that should take place between the water resources planner, designer, and manager and the data collector. The design of a data collection program presupposes knowledge of the sensitivity of a particular planning model to variance in the hydrologic input. If this is known, appropriate hydrologic models, analytical techniques, and accuracy requirements can be specified that will define the required sampling program. The data program organizer usually establishes data program objectives and accuracy requirements subjectively either through conversations with the water resources planner or by intuitive reasoning. An alternative approach would require the program organizers to examine different classes of available planning models and their accuracy requirements. (See also W71-08550) (Knapp-USGS)
W71-08883

A WATER QUALITY INDEX - DO WE DARE,
National Sanitation Foundation, Ann Arbor, Mich; and Michigan Univ., Ann Arbor. School of Public Health; and Michigan Univ., Ann Arbor. School of Natural Resources.
Robert M. Brown, Nina I. McClelland, Rolf A. Deininger, and Ronald G. Tozer.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 364-383, 1970. 20 p, 4 fig, 8 tab, 7 ref.

Descriptors: *Surveys, *Water quality, *C
ferences, Statistical methods, Pollutant identifi
tion, Water pollution control, Water quality c
trol.
Identifiers: *Surveys (opinion), *Questionnai
*Water quality index.

Based on a survey of water pollution workers, a
gle numerical expression which reflects the c
posite influence of significant parameters of w
quality is proposed. The index provides a mean
ful, uniform method for assessing the overall qu
ty of a stream, comparing stream conditions at
ferent points in space and time, and measu
progress in water pollution abatement progra
The eleven most significant parameters are
solved oxygen, biochemical oxygen demand,
bidity, total solids, nitrates, phosphates, pH,
perature, fecal coliforms, pesticides, and toxic
ments. (See also W71-08550) (Knapp-USGS)
W71-08884

**WATER QUALITY MANAGEMENT DATA
SOCIATED WITH RESERVOIR OPERATIO**
Corps of Engineers, Washington, D.C.
Kenneth S. Eff.
Proceedings of the National Symposium on
and Instrumentation for Water Quality Man
ment, Conference of State Sanitary Engineer
Wisconsin University, July 21-23, 1970, Mad
Wis, p 384-394, 1970. 11 p, 11 ref.

Descriptors: *Data collections, *Sampling, *W
quality, *Reservoir operation, *Reservoir de
Reservoir stages, Water quality control, Wate
lution control, Monitoring, Surveys.
Identifiers: *Water quality data.

Water quality data collection is needed for
voir planning and design and to evaluate condi
in four phases of water resource development
prior to impoundment, (2) during construction
on completion of construction, and (4) as a
tinuing function of reservoir operations. P
poundment data should cover all parameters,
mal, chemical and biological, to assure a
basis for planning and design and for evalu
changes attendant to and resulting from the
struction and operation of the reservoir. D
construction, it is important to monitor the
of the contractors' operations on water qu
This includes observation of sediment dep
After construction, sampling provides gui
during operations for comparison with the p
poundment data. (See also W71-08550) (K
USGS)
W71-08885

**APPLICATION OF ELECTRONIC MONI
TO RIVER QUALITY FORECASTING,**
Ohio River Valley Water Sanitation Comm
Cincinnati.
R. J. Boes.
Proceedings of the National Symposium on
and Instrumentation for Water Quality Ma
ment, Conference of State Sanitary Enginee
Wisconsin University, July 21-23, 1970, Ma
Wis, p 395-405, 1970. 11 p, 3 fig.

Descriptors: *Monitoring, *Water quality,
River, Dissolved oxygen, Hardness (W
Sulfates, Alkalinity, Water pollution control,
tant identification, Probability, Mathem
models, Forecasting, Statistical methods, Va
ty.
Identifiers: *Water quality data.

Electronic monitor systems are aids to wate
ty management. Methods are available for th
tinuous evaluation of the influence of such
as municipal and industrial waste water disc
hydropower generation, tributary streams,
runoff and storm overflows for the predic
resultant water quality conditions in the re
streams. The ninety-five mile Markland Po
the downstream seventy-three miles Mc
Pool of the Ohio River encompass sectio
river system that offer opportunity for d

dy of factors influencing stream quality. Initial
tistical evaluation of interparameter relation-
os shows that the electronic monitor values pro-
e information for the estimation of total hard-
s, sulfate and dissolved solids concentrations
n acceptable accuracy and may be of value for
mating alkalinity levels. (See also W71-08550)
app-USGS)
1-08886

**TER QUALITY MODELLING WITH SUB-
RSIBLE RECORDING WATER QUALITY
D CURRENT METERS,**
ario Water Resources Commission, Toronto.
er Quality Surveys Branch.
D. Palmer, and J. B. Izatt.
ceedings of the National Symposium on Data
Instrumentation for Water Quality Manage-
t, Conference of State Sanitary Engineers and
consin University, July 21-23, 1970, Madison,
p 406-418, 1970. 13 p, 4 fig, 2 tab, 6 ref, ap-
d.

criptors: *Mathematical models, *Water pollu-
effects, *Path of pollutants, *Monitoring,
eat Lakes, Markov processes, Time series anal-
Dispersion, Current meters, Water quality,
er chemistry, Data collections, Correlation
ysis, Frequency analysis, Variability.
tifiers: *Water quality data, Ontario (Canada),
ada.

Ontario Water Resources Commission is
loping mathematical assimilation models for
nearshore areas of the Great Lakes. Good
r management requires the models to assist in
tion of water intakes and waste outfalls with a
mum of interference with water users.
elling is complicated in the nearshore areas of
Great Lakes as water environmental charc-
tics have been found to be variable in both
and space. The physical characteristics of cur-
and temperature were modelled in two dimen-
by applying time series analysis and Markov
n techniques to recording current meter data.
e models are capable of predicting the dis-
tion of passive contaminants. The time series
od generates monthly mean dispersion
acteristics while the Markov chain process de-
hourly dispersion patterns. (See also W71-
0) (Knapp-USGS)
-08887

**ICOMPUTERS AND WATER QUALITY
VEILLANCE,**
icapolis-St. Paul Sanitary District, St. Paul,
.
s J. Anderson.
ceedings of the National Symposium on Data
Instrumentation for Water Quality Manage-
, Conference of State Sanitary Engineers and
onsin University, July 21-23, 1970, Madison,
p 420-429, 1970. 10 p, 1 fig, 2 tab, 23 ref.

riptors: *Digital computers, *Data processing,
drologic data, *Water quality, *Data collec-
Telemetry, Instrumentation, Sampling,
toring, Dissolved oxygen, Automation, Elec-
conductance, Data storage and retrieval,
r management (Applied), Systems analysis,
ematical models, Simulation analysis.
ifiers: *Water quality data.

newly developed minicomputer offers the op-
nity for improvements in water quality data
sition and monitoring. These devices are
ble for use with conventional parametric water
ly monitoring stations and for use with other
complicated process stream analyzers. While
nated data acquisition cannot be compared
tly with historical manual methods, the costs
achieving similar objectives have reached
r orders of magnitude and are roughly com-
le in certain cases. The typical minicomputer
about $10,000, weighs about 50 pounds, and
ies a space of a little more than 2 cubic feet.
e machines provide computing speeds mea-
sured in microseconds and computing and control capabilities equivalent to machines costing ten times as much only a few years ago. This may result in cost-effectiveness improvement of about 800 to 1. (See also W71-08550) (Knapp-USGS)
W71-08888

THE WATER MANAGEMENT INFORMATION SYSTEM (WAMIS),
Spindletop Research, Inc., Lexington, Ky.
James A. Sena.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 430-439, 1970. 10 p, 5 fig.

Descriptors: *Digital computers, *Data processing, *Hydrologic data, *Water quality, *Data collections, Telemetry, Instrumentation, Sampling, Monitoring, Dissolved oxygen, Automation, Electrical conductance, Data storage and retrieval, Water management (Applied), Systems analysis, Mathematical models, Simulation analysis.
Identifiers: *Water quality data.

The Water Management Information System was developed for the Commonwealth of Kentucky with the aid of a grant from the Water Resources Council. The system uses an IBM 360/65 at the University of Kentucky. WAMIS is intended for use primarily by the managers of Kentucky's water resources. In many cases broad indications can be given to even the engineer for such studies as small watershed analyses. The system makes it possible for the manager to identify water-related problems, to evaluate alternative solutions to these problems, and to determine existing or future attributes of data carried in the system concerning a particular location. The data base currently consists of data on population, employment, water demand, and water supply. Provisions were made to include recreation, water quality, and flood control data. (See also W71-08550) (Knapp-USGS)
W71-08889

EXPERIENCE WITH COMPUTER USE IN MANAGING WATER QUALITY DATA IN THE DELAWARE RIVER BASIN,
Geological Survey, Philadelphia, Pa.
Richard W. Paulson.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 454-467, 1970. 14 p, 8 fig, 2 ref.

Descriptors: *Digital computers, *Data processing, *Hydrologic data, *Water quality, *Data collections, *Delaware River Basin Commission, Telemetry, Instrumentation, Sampling, Monitoring, Dissolved oxygen, Automation, Electrical conductance, Data storage and retrieval, Water management (Applied), Systems analysis, Mathematical models, Simulation analysis.
Identifiers: *Water quality data.

The U.S. Geological Survey's Water Resources Division office in Philadelphia, Pennsylvania, operates a system of eleven water quality monitors in the Delaware River basin. The objective of the system is to continuously monitor the water quality parameters of dissolved oxygen concentration, specific conductance at 25 deg C, temperature, and pH. This paper briefly summarizes the data processing system devised to process, edit, and summarize these water quality monitor data. The objective of this data processing system is to provide water resources agencies in the basin with water quality data in a concise and unable form on a reasonably current basis. The system also makes available, in a computer-compatible format, water quality data for scientific and engineering studies of water resources in the basin. (See also W71-08550) (Knapp-USGS)
W71-08890

BENEFICIAL USES AND PITFALLS OF HISTORICAL WATER-QUALITY DATA,
Geological Survey, Washington, D.C.
Timothy Doak Steele.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis., p 346-363, 1970. 18 p, 3 fig, 5 tab, 4 ref.

Descriptors: *Data collections, *Water quality, *Data processing, Planning, Systems analysis, Statistical methods, Sampling, Statistics.
Identifiers: *Water quality data.

Many water-quality data have been gathered in the past twenty years. Emphasis on data processing and storage often obscures efforts to derive the full benefit of the information. Data analysis is a necessary link between routine computer processing of water-quality data and data evaluation. In evaluation, the information derived from data is tested against the stated or implied objectives of the data-collection program, and alternate indirect methods at reduced cost are sought for providing information fulfilling the objectives that are satisfied directly using actual data. The application of several statistical techniques to the analysis of historical records of streamflow inorganic chemical quality is described. Results from data analysis of numerous records suggest that data-collection activities of inorganic constituents often might be reduced without substantial loss of information, thus allowing funds and manpower to be redirected to the collection and analysis of other types of data. (See also W71-08550) (Knapp-USGS)
W71-08891

POTENTIAL BENEFITS OF MATHEMATICAL MODELS AND COMPUTERS FOR WATER QUALITY MANAGEMENT PROGRAMS,
New York Univ., N.Y. Dept. of Civil Engineering.
Alvin S. Goodman.
Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis., p 440-453, 1970. 14 p, 1 fig, 48 ref.

Descriptors: *Digital computers, *Data processing, *Hydrologic data, *Water quality, *Data collections, Telemetry, Instrumentation, Sampling, Monitoring, Dissolved oxygen, Automation, Electrical conductance, Data storage and retrieval, Water management (Applied), Systems analysis, Mathematical models, Simulation analysis.
Identifiers: *Water quality data.

For the effective and economic operation of water quality management programs, it is desirable to coordinate manual field and laboratory studies, automatic monitoring, and mathematical model investigations. This paper reviews the problem areas for which the techniques of mathematical modeling are well advanced. The improvement of data collection programs, particularly those involving automatic monitoring should be undertaken through research and application of mathematical methods and the electronic computer. (See also W71-08550) (Knapp-USGS)
W71-08892

HYDROLOGIC DATA UTILIZATION IN FORECASTING THE SPRING 1969 MIDWEST SNOWMELT FLOODS,
Environmental Science Services Administration, Kansas City, Mo., Weather Bureau River Forecast Center.
For primary bibliographic entry see Field 02E.
W71-08893

COMPUTERIZED PROGRAMS FOR MICHIGAN'S WATER MANAGEMENT SYSTEM,
Michigan Water Resources Commission, Lansing; and Ernst and Ernst, Detroit, Mich.
Gary E. Guenther, and Stuart Egan.

Proceedings of the National Symposium on Data and Instrumentation for Water Quality Management, Conference of State Sanitary Engineers and Wisconsin University, July 21-23, 1970, Madison, Wis, p 482-489, 1970. 8 p, 5 ref.

Descriptors: *Data storage and retrieval, *Data processing, *Hydrologic data, *Water quality, *Michigan, Digital computers, Data collections, Monitoring, Water pollution control, Water management (Applied).
Identifiers: *Water quality data.

The digital computer eases the solution of several problems in the field of pollution control, particularly those which involve repetitive operations. Two examples of these are the calculation of dissolved oxygen profiles for waste assimilation analyses and the calculation of water surface profiles for flood plain determination. Michigan's programs for water-management systems include: operating reports concerning quality and quantity of effluent or intake; reports of staff visits; reports of staff surveys at which quality and quantity data were collected; reports of property tax exemption status for pollution control devices; reports of annual performance rating; reports of all Commission actions concerning hearings and orders; reports of performance due, such as date of start of construction; and reports of judicial action, such as filing of briefs. (See also W71-08550) (Knapp-USGS)
W71-08894

CATALOG OF INFORMATION ON WATER DATA, EDITION 1970 - INDEX TO AREAL INVESTIGATIONS AND MISCELLANEOUS WATER DATA ACTIVITIES.
Geological Survey, Washington, D. C. Office of Water Data Coordination.
For primary bibliographic entry see Field 07C.
W71-08922

NATIONAL REFERENCE LIST OF WATER QUALITY STATIONS-WATER YEAR 1971.
Geological Survey, Washington, D. C. Water Resources Div.

Geological Survey National Reference List of Water Quality Stations, 1971. 825 p, 7 tab, index.

Descriptors: *Water quality, *Surface waters, *Data collections, *United States, *Information retrieval, Reviews, Water chemistry, Chemical properties, Physicochemical properties, Chemical analysis, Water temperature, Sediments, Sampling, Projects, Hydrologic data, Documentation, Data storage and retrieval, Streams, Lakes, Reservoirs, Data processing.
Identifiers: *National reference list, *Water quality stations.

The water-quality stations listed in this volume (1971 water year) are maintained by the U. S. Geological Survey in cooperation with other agencies for the collection of basic data on the chemical, biological, microbiological, and physical characteristics of streams, lakes, and reservoirs in the United States and its territories. The stations are listed in three sections; in alphabetical order by State, in downstream order by part (major drainage basins), and stations that discontinued operations at the end of the previous water year. Data listed for each station consist of: Identification number, latitude and longitude, station name, drainage area, State, county, date established, type of data collected (chemical, sediment, temperature), available discharge records, frequency of smapling, type of project, source of operating funds, number of years the station has been in operation, and the constituents determined by analysis in the laboratory, in the field, or by digital monitor. The data collected from stations on this list may be obtained by writing the U. S. Geological Survey, Water Resources Division, Automatic Data Processing Unit, Washington, D. C. 20242. (Woodard-USGS)
W71-08937

5B. Sources of Pollution

ESTUARINES, BAYS AND COASTAL CURRENTS AROUND PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
Ernesto F. Colon.
Puerto Rico University Water Resources Research Institute Partial Technical Completion Report 2, Mar 1971. 15 p, 3 fig. OWRR Project A-031-PR (3).

Descriptors: *Ocean currents, *Data collections, *Path of pollutants, *Instrumentation, *Puerto Rico, Measurement, Water temperature, Velocity, Bays, Estuaries, Municipal wastes, Industrial wastes.

For many years, domestic and industrial wastes have been discharged along the coastal waters of Puerto Rico without adequate treatment in most cases. This report presents data concerning movement of coastal waters along Puerto Rico to better understand the path of pollutants. Model 502 in-situ current direction, temperature, and velocity meters were used during half-moon cycle periods to collect the data. The information can be utilized in further studies using relevant data such as tide tables, tidal current tables, moon phases and wind direction available from airport, industrial and weather bureau information sources. (Woodard-USGS)
W71-08322

MERCURY IN THE ENVIRONMENT--SURFICIAL MATERIALS OF THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-08326

DETECTION OF OIL SLICK POLLUTION ON WATER SURFACES WITH MICROWAVE RADIOMETER SYSTEMS,
Microwave Sensor Systems, Inc., Downey, Calif.; and California Univ., Santa Barbara.
For primary bibliographic entry see Field 05A.
W71-08361

MULTISPECTRAL SENSING OF OIL POLLUTION,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05A.
W71-08363

AN INVESTIGATION OF INDUSTRIAL AND MUNICIPAL WASTE WATER QUANTITY, COMPOSITION, AND TREATMENT IN THE REEDY RIVER BASIN,
Clemson Univ., S.C. Environmental Systems Engineering Program.
For primary bibliographic entry see Field 05D.
W71-08424

LITERATURE SURVEY: THE USE OF BACTERIA AS INDICATORS OF FAECAL POLLUTION IN WATER,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
W. O. K. Grabow.
CSIR special Report O/WAT 1, p 1-27, UDC 543.39:628.19. 74 ref.

Descriptors: *Bioindicators, Water quality, control, Coliforms, E. Coli, Enteric bacteria, Pathogenic bacteria, Bacteria, Salmonella, Streptococcus, Analytical techniques, Separation techniques, Sampling, Meus-membrane filters, *Pollutant identification, *Reviews.
Identifiers: *Faecal coliforms.

Study and discussion revealed the fact that although positive tests for certain indicator organisms, such as faecal streptococci and E. coli I. indicate the presence of pollutant at some u specified time in the past, a negative result on tes provides no information whatsoever. Also, positiv results provide no concrete and definite inform tion that the waters from which the organisms we isolated were polluted. Indicator organisms ha been assumed to be always present in faecal mate als, and to die off more slowly than any of t pathogenic bacteria. However, the complexity factors which determine bacterial kinetics is su that generalizing is very dangerous. Each differe situation occasions a different response from d ferent bacteria. Artificial filtration procedures su as chlorination, filtration, and flocculation m remove enough bacteria to allow bacteriologi examination to certify the water as safe to dri even though it was recently polluted. Therefo although indicator organisms are a useful tool casting suspicion on waters which may or may be contaminated, use of indicators alone will determine whether the water is safe. Presence of dicators, should be the signal for more compreh sive investigations. (Lowry-Texas)
W71-08425

TRANSPORT PROCESSES OF PARTICLES DILUTE SUSPENSIONS IN TURBULE WATER FLOW - PHASE I,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 08B.
W71-08492

WATER QUALITY STUDY OF THE POPL RIVER, DOUGLAS COUNTY, WISCONSI TRIBUTARY TO LAKE SUPERIOR,
Wisconsin State Univ., Superior. Dept. of Che try; and Wisconsin Univ., Madison. W Resources Center.
Donald A. Bahnick, Joseph W. Horton, and Ro K. Roubal.
Reprint, Proceedings, 13th Conference G Lakes Research, 651-658, International Asse tion Great Lakes Research, 1970, 8 p, 4 fig, 1 t ref. OWRR Project A-023-WIS (9).

Descriptors: *Nutrients, *Chemical anal *Water quality, *Dissolved oxygen, *Chemica ygen demand.
Identifiers: *Inorganic constituents, *Elect characteristics, Poplar River, Bois Brule R Lake Superior, Douglas County, Wisconsin.

Chemical parameters for the Poplar River, Wi sin (35 square mile drainage) are prese Parameters determined were nitrogen, phosph copper, dissolved oxygen, chemical oxyge mand, specific conductance, color value, solids, and pH. The results indicate that the quality of the Poplar River is high. Comparis these results with those obtained previously f Bois Brule River, Douglas County, shows small differences in the chemical parameters are ascribed mainly to differences in the siz nature of the two drainage basins. The Bois River has a larger drainage basin and drains sively marshy regions, while the basin of the P River encompasses largely Pleistocene red areas. Both rivers are tributary to Lake Superi
W71-08495

DISTRIBUTION OF SELECTED METAL BOTTOM SEDIMENTS,
Illinois Univ., Urbana. Water Resources Cent
B. J. Mathis, and T. F. Cummings.
Available from the National Technical Inform Service as PB-199 713, $3.00 in paper copy in microfiche. Water Resources Center, Uni of Illinois, Urbana, Research Report No 41, 71-0041, Mar, 1971. 45 p, 25 fig, 6 tab, OWRR Project A-034-ILL (1).

Descriptors: Water pollution sources, metals, *Biota, Illinois River, Copper, Nicke Calcium, Lead, Chromium, Potassium, M um, Lithium, Sodium, Zinc, Cobalt, Cad

mic absorption spectrophotometry, *Benthos, quatic environment, Linology, *Food chain, c environment.

study was designed to assess the potential ap- ation for further research of metal contamina- in a large mid-western river that is utilized by stries and certain cities as a source of potable r as well as for sewage disposal. Analyses were e for thirteen metals in bottom sediments, ve in water, and ten in tubificid worms, clams, fishes. The study revealed that the ten metals, vhich analyses were made in biota, do not con- rate along successive trophic levels as is the with pesticides. Organisms such as clams and ns that inhabit the mud or mud-water interface e metal concentrations were observed to be ighest, exhibited the highest metal concentra- . At higher trophic levels, however, concentra- were lower, with fishes that are primarily car- ous in nature exhibiting the lowest concentra- . The problem of metal contamination in tic systems is just now being recognized as a ntial hazard to human health while the degree nich aquatic biota are affected remains specu- . This study, basically a pilot study, outlines edures by which similar studies can be made provides data that others may use in assessing egree of metal contamination in multiple use .
-08497

E AND RIVER POLLUTION, AN AN- ATED BIBLIOGRAPHY,
n Sinha.
able from Ocean Engineering Information ce, PO Box 989, La Jolla, California 92037, 0. Ocean Engineering Information Series No 71, 85 p.

iptors: *Bibliographies, Lakes, Rivers, er pollution sources, *Water quality control, er pollution effects, Pollutant identification, tracts, Path of pollutants, Pollution abate- Pollutants.
fiers: Water quality management.

bibliography contains 601 abstracts of litera- providing scientific and technical information ed from local and regional studies in labora- nd field investigations of lake and river pollu- These deal with the parameters of pollution pollutants; the agricultural, atmospheric, stic, and industrial sources of pollution and ffects of engineering activities; hydrological, gical and meteorological processes involved erstanding the paths of pollutants; the effects lution on fishes, invertebrates including in- macrophytes, plankton, zooplankton, bac- fungi, viruses and yeasts, birds, and on human . Trends in water quality management are nsidered. A bibliography of bibliographies, a d subject outline, a keyterm index and an citing all authors and coauthors are included. sented are world wide sources found in 144 ls, some 25 national and international con- es and more than 80 additional sources con- of governmental research reports, institu- and industrial contract reports. Intended as a in interdisciplinary studies of lake and river on. Coverage 1968-1970 inclusive.
08498

CURY IN THE ENVIRONMENT-THE AN ELEMENT,
idge National Lab., Tenn.
A. Wallace, Wilbur D. Shults, William son, and William S. Lyon.
ORNL NSF-EP-1, Jan, 1971. 61 p, 14 fig, 280 ref. AEC Contract No W 7405-eng-26; teragency Agreement AAA-R-4-79.

ptors: Water pollution sources, Water pollu- fects, Industrial wastes, Environment, Ecolo- cial aspects, Toxicity, Lethal limit, Path of nts, Standards, Aquatic environment, Heavy metals.

Identifiers: *Mercury, Methylmercury, Alkylmercury.

This is a review of the uses, sources, distribution, and toxic effects of mercury, and the main emphasis is on man as the distributor and recipient of mercury in the environment. There is a need to pay more attention to the social implications of present use practices and to recycle much more effectively or develop alternatives to present mercury technology. The principal man-made sources of environmental mercury in the U.S. are chlor-alkali plants, smelting operations, and probably the burning of fossil fuels, wheras the principal natural sources are the land mass itself and geothermal processes. Data for 'background' and 'contaminated' situations in air, water, rocks, soils, sediments, sludges, fossil fuels, plants, animals, foods, and man are drawn together and briefly evaluated. Mercury, in whatever form, is potentially exchangeable among the air, land, and water phases, and it is essentially indestructible. 'Abnormal' concentrations of mercury in terrestrial animals appear concomitantly with the introduction of alkylmercury seed dressings in agriculture during the 1940's, but that mercury levels in fish have steadily risen over the past 100 years in parallel with increased industrial activity. Only the highly toxic methylmercury form is found in the flesh of fish. The formation of methylmercury appears to be promoted by bacterial processes occuring within contaminated bottom sediments, and such sediments can slowly release their mercury burden as methylmercury for many years to come. Alkylmercurials primarily affect neurological processes because of their ability to cross the blood-brain barrier, and they appear to be several orders of magnitude more toxic than other mercury compounds. Mercury vapor is intermediate between the alkylmercurials and other mercury compounds in its effects. Pronounced toxicity is due to lengthy retention by the body. No effective antidote is presently available for these compounds. The criteria for mercury levels are based almost entirely on relatively short-term effects. Tentative standards and guidelines have been set by several organizations and U.S. Government agencies for mercury in air, drinking water, and food. Appendices are included which consider aspects of the physical and chemical properties of mercury.
W71-08515

SEA-WATER INTRUSION: BOLSA-SUNSET AREA, ORANGE COUNTY,
California Dept. State of Water Resources, Sacramento.
John R. Cummings, and Chester A. Carville.
California Department of Water Resources Bulletin No 63-2, Jan 1968. 167 p, 14 fig, 14 plate, 16 tab, 42 ref.

Descriptors: *Saline water intrusion, *Aquifers, *California, Groundwater movement, Path of pollutants, Withdrawal, Chlorides, Salinity, Sea water, Connate water, Aquicludes, Faults (Geology), Hydrogeology, Recharge.
Identifiers: *Orange County (Calif).

The Bolsa-Sunset area, a 6.8-mile-long strip of alluvial-tidal flats and low structural hills and mesas, comprises 55% of the Pacific shoreline of the 330-square-mile coastal plain of Orange County, California. Fresh confined groundwaters containing less than 50 ppm chloride occur in moderately to highly permeable early Recent, Pleistocene, and upper Pliocene sand and gravel aquifers landward of the active Newport-Inglewood fault. The fault, located 3,000 to 5,500 feet inland from and approximately parallel to the coast, forms a variable watertight hydraulic barrier across the area, except in late Recent deposits. Pumping of fresh groundwater in excess of recharge caused a 1945-57 decline of inland piezometric levels to elevations of 30 and 50 feet below sea level in the upper aquifers and in the Main aquifer, respectively. Inland and downward head differentials caused intrusion of saline groundwaters through permeable portions of the fault barrier and through discontinuities in the upper aquiclude. Artificial recharge to the basin forebay and a partial reduction in pumping caused a recovery of piezometric levels during 1959-65. Freshwater heads reached sea level in late 1964 and seasonal artesian flow has existed since. Ion concentrations of groundwaters degraded by sea water intrusion, oil field brines and semiperched water have decreased from peak limits reached in 1961-62. Intrusion and brine wedges have retreated or have become stabilized. (Knapp-USGS)
W71-08527

SYMPOSIUM ON MULTIPLE-SOURCE URBAN DIFFUSION MODELS.

Arthur C. Stern, editor. For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $1.75. Proceedings of Symposium on Multiple-Source Urban Diffusion Models, Oct 27-30, 1969, North Carolina University: US Environmental Protection Agency, Air Pollution Control Office Publication No AP-86, 1970. 401 p.

Descriptors: *Air pollution, *Cities, *Atmosphere, *Path of pollutants, *Diffusion, Air-earth interfaces, Meteorology, Air circulation, Mass, Energy Vapor pressure, Pollutants, Model studies, Equations, Advection, Convection, Tracers, Synoptic analysis, Reviews.
Identifiers: *Symposium (Air pollution).

This symposium concerning air pollution in urban surroundings was conducted by the Meteorology Division of the National Air Pollution Control Administration (NAPCA) and the Department of Environmental Sciences and Engineering, School of Public Health, University of North Carolina at Chapel Hill (UNC), Oct. 27-30, 1969. The papers presented during the symposium are contained in this volume and include (1) Diffusion Modeling for Urban Air Pollution Abatement and Control; (2) Physical and Meteorological Basis for Mathematical Models of Urban Diffusion Processes; (3) Prediction of Diffusion over an Urban-Area--Current Practice and Future Prospects; (4) Some Miscellaneous Aspects of Current Urban Pollution Models; (5) Development of a Practical, Multi-purpose Urban Diffusion Model for Carbon Monoxide; (6) An Urban Atmospheric Dispersion Model, (7) Sensitivities of Air Quality Prediction to Input Errors and Uncertainties; (8) Elevation of Tracer Cloud over an Urban Area; (9) Numerical Simulation of the Temporal and Spatial Distributions of Urban Air Pollution Concentration; (10) A Model of Diffusion in Urban Atmospheres: SO2 in Greater New York; and (11) Analysis of Multiple-Station Urban Air Sampling Data. (Woodard-USGS)
W71-08533

THE PROTECTION OF GROUNDWATER RESOURCES.
For primary bibliographic entry see Field 04B.
W71-08542

RECOGNITION OF BUNKER OILS BY THIN-LAYER CHROMATOGRAPHY,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05A.
W71-08608

MERCURY CONTENT OF VARIOUS BOTTOM SEDIMENTS, SEWAGE TREATMENT PLANT EFFLUENTS AND WATER SUPPLIES IN WISCONSIN (A PRELIMINARY REPORT),
Wisconsin Dept. of Natural Resources, Madison.
John G. Konrad.
Research Report 74, 1971. 16 p, 7 fig, 10 tab, 7 ref.

Descriptors: *Heavy metals, *Water pollution sources, *Sediments, *Stream pollution, *Hydrogen ion concentration, *Pulp wastes,

*Chemical wastes, Wisconsin, Effluents, Sewage effluents, Industrial wastes, Waste water disposal, Water pollution, Environmental sanitation, Impaired water quality, Path of pollutants, Public health, Pollution abatement, Water pollution effects, Wisconsin.
Identifiers: *Mercury pollution, Mercury.

Samples were taken from 168 locations in 30 river and stream systems of Wisconsin, and were analyzed by atomic absorption spectrometry. All bottom sediments were found to contain background mercury concentrations of less than 0.01 to 0.35 ppm, depending on the texture of the sediment. High mercury deposits were found below the discharges of the Wyandotte Chemicals Company at Port Edwards on the Wisconsin River and below several pulp and paper mills on the Wisconsin, Chippewa, Flambeau, Wolf, Menominee and Fox Rivers. Accumulations in fish were found to occur where the pH of the water was below 7.5. Significant amounts of mercury were found below several sewage treatment plants which accept mercury-containing wastes. All public surface water supplies sampled contained less than 0.2 ppb mercury. (LeGore-Washington)
W71-08609

MERCURY LEVELS IN FISH FROM SELECTED WISCONSIN WATERS (A PRELIMINARY REPORT),
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05C.
W71-08610

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT (DEC. 1, 1970 TO MARCH 1, 1971),
New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 05C.
W71-08649

RADIOCARBON IN THE SEA,
Washington Univ., Seattle.
For primary bibliographic entry see Field 05A.
W71-08650

GROUND WATER SAFETY EVALUATION - PROJECT GASBUGGY,
Teledyne Isotopes, Polo Alto, Calif. Palo Alto Labs.
For primary bibliographic entry see Field 05G.
W71-08652

PHYSICAL AND BIOLOGICAL EFFECTS: MILROW EVENT. CHAPTER 4: RADIOACTIVITY,
Nevada Operations Office (AEC), Los Vegas.
M. L. Merritt.
Available from NTIS NVO-79. NVO-79, p 41-8.

Descriptors: *Nuclear explosions, *Water pollution, *Tritium, Groundwater movement, Surface waters, Surface-groundwater relationships, Alaska.

After more than a year, no release of radioactivity from Milrow has been detected. The activity formed remains near the explosion point at 4,000 ft depth. Predictions are made that when the chimney fills with ground water and normal ground water flow patterns are resumed, the flow will be so slow that the tritium concentrations will be reduced below the Radiation Concentration Guide for drinking water for the general public before the tritiated water reaches the ocean. Methods used to measure the release of radioactivity from both Long Shot and Milrow Events on Amchitka Island, Alaska are discussed. (Bopp-ORNL)
W71-08653

THE SANITATION SITUATION OF THE MARINE COASTAL WATERS OF NORTH SARDINIA IN RELATION TO INDUSTRIAL POLLUTION AND URBAN SEWAGE, (SITUAZIONE IGIENCIA DELLE A CQUE MARINE COSTIERE DEL NORD-SARDEGNA IN RAPPORTO ALL' INGUINAMENTO INDUSTRIALE E FOGNARIO-URBANO),
Sassari Univ. (Italy). Instituto di Igiena.
G. Bo, U. Alamanni, A. Maida, E. Bianchi, and S. Pettinato.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Foundation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 245-251. 6 ref.

Descriptors: *Coasts, *Pollutant identification, *Pulp and paper industry, *Oil wastes, *Chemical wastes, *Domestic wastes, Sewage, Industrial wastes, Water pollution sources.
Identifiers: *Sardinia, *Italy, Alghero, Portotorres, Olbia, Arbatax.

Results of research carried out over the past two years in the coastal waters of North Sardinia (Alghero, Portotorres, Olbia, and Arbatax) is reported. A certain degree of pollution was caused by domestic sewage, a considerable degree by paper-mill wastes and a very modest degree by petrol-chemical industries at Portotorres. (Ensign-PAI)
W71-08723

HYGIENIC SITUATION OF SARDINIAN COASTAL WATERS,
Cagliari Univ. (Italy). Instituto di Igiena.
Lorenzo Ciogli.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Foundation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 235-243. 11 ref.

Descriptors: *Coasts, *Water pollution control, Preservation, Industrial wastes, Domestic wastes, Public health, Pollutant identification, Water pollution sources, Waste disposal.
Identifiers: *Sardinia, *Italy.

Investigations carried out during the period of 1959-1969 indicated that the hygienic state of the Sardinia coastal waters is generally good if not excellent. The contaminated areas are limited and the degree of pollution is slight and generally due to domestic waste. Careful re-examination of disposal methods could remedy much of the trouble, particularly the aesthetic aspect which is so important to tourist localities. Industrial pollution appears to be more difficult to eliminate and is apt to become more serious. Strict control is necessary in order to preserve the purity of the Sardinian coastal waters, which is still one of the island's most beautiful attractions. (Ensign-PAI)
W71-08724

INVESTIGATIONS ON THE STATE OF POLLUTION OF THE COASTAL WATERS OF THE ITALIAN PENINSULA, (ENQUETES SUR L'ETAT DE POLLUTION DES EAUX COTIERES DE LA PENINSULE ITALIENNE),
Bologna Univ. (Italy). Instituto Igiena.
P. Ambrosioni, P. Bisbini, and M. Marinelli.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Foundation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 225-234.

Descriptors: *Coasts, *Water pollution control, *Pollutant identification, *Industrial wastes, *Municipal wastes, *Water treatment, Treatment facilities, Human population, Waste water disposal, Water pollution sources.
Identifiers: *Italy.

To approximate the pollution situation of the entire Italian seaboard, doctors, scientists, directors of chemical laboratories and sanitation officers of th coastal areas of Italy were consulted. Local sewa purification, the existence of treatment ponds, th presence of industrial pollution, the scope of th polluted areas along the shore and from sho toward high sea, and the eventual disadvantag caused by actual conditions were considered. Co tributing to the situation are ten million inhabitan or 1/5th of the population living along the Itali coast in 300 dwelling centers. Eleven percent urban agglomerations were found to purify th waste waters before disposal. This occurred only in small centers, but in large cities like Ge (880,000) Bari (316,800), Triest (272,00 Reggio-Calabria and others. In some cases wa waters are disposed without any treatment i small streams a few kilometers from the sea. Thi true of Rome, where sewage is discharged in Tibre. Forty-six percent of the coastal areas are posed to industrial pollution. Thirty-two percen these outfalls support some purification treatm of which seventy-five percent are revealed to very unsatisfactory. (Ensign-PAI)
W71-08725

VIABILITY OF ENTAMOEBA HISTOLYTI CYSTS EXPOSED TO SEA WATER,
Technion - Israel Inst. of Tech., Haifa (Isra Sanitary Engineering Labs.
Hanna Kott, and Yehuda Kott.
Revue Internationale d'Oceanographie Medic Centre d'Etudes et de Recherches de Biologi d'Oceanographie Medicale, Institut National d Sante et de la Recherche Medicale, Fondation Ville de Nice, Nice, Vols 18 and 19, 1970, p 85 3 ref.

Descriptors: *Sewage disposal, Outlets, *Bact *Coliforms, Viability, Public health, Urbaniza Water pollution sources, Water treatment.
Identifiers: *Entamoeba histolytica, Cysts.

Scientific, engineering and economic aspects be taken into consideration for solution problems created by urbanization. The theore potential hazard of Entamoeba histolytica carried in sewage drift to beaches in which p swim is evaluated. Samples were taken from water coming to the municipal sewage treat plant and Entamoeba histolytica cysts abund was determined by flotation tests. Influent sa showed a mean of 42/10 liter cysts to a me 7/10 liter cysts in effluent samples. Survival st were also carried out on these cysts and parisons made in seawater without raw sewag in the natural marine environment near an o (Ensign-PAI)
W71-08735

DISTRIBUTION OF SOME PARASITIC GE AND PATHOGENIC BACTERIA IN WO WIDE WATERS, (DISTRIBUTION GERMES PARASITES DES BACTE PATHOGENES DANS LES EAUX MONDIA
Institut Pasteur, Paris (France); Murma Biologicheskaya Stantsiya (USSR); Akademiya Nauk SSSR, Leningrad. Zoologi Institut.
A. Guelin, I. Bychovskaja, P. Lepine, and D. Lamblin.
Revue Internationale d'Oceanographie Me Centre d'Etudes et de Recherches de Biol d'Oceanographie Medicale, Institut Nationa Sante et de la Recherche Medicale, Fondatio Ville de Nice, Nice, Vols 18 and 19, 1970, p 26 ref.

Descriptors: *Self purification, *Ba *Pathogenic bacteria, *Animal parasites, M ganisms, Equilibrium, Water pollution Water purification.

Bacterial antagonism or the struggle betwe cies of microorganisms in polluted wat tributes to the biological purification of wa distruction of pathogenic bacteria by parasitic germs is not only a lab

enomenon but has occurred in coastal waters of the continents of the world. Parasitic activity ainst other bacteria occurs in a wide range of nperatures. Some parasites can survive in water autotrophs, without additional nutrients until host bacteria allows their development as asites. The parasitic germs are needed for the ropopulation equilibrium in the sea. (Ensign-l)
1-08736

RTHER CONTRIBUTIONS TO THE STUDY THE BIOPRODUCTIVITY IN POLLUTED RINE ECOSYSTEMS,
diterranean Marine Sorting Center, Salammbo nisia).
primary bibliographic entry see Field 05C.
1-08739

E POLLUTION OF THE COASTAL OCEAN D THE GREAT LAKES,
Grant Gross.
ted States Naval Institute. Proceedings, Vol 97, 819, p 228-243, May 1971. 2 tab.

criptors: *Coasts, *Great Lakes, *Water pollu- sources, *Water pollution effects, Water agement, Waste disposal.

assessment is made of waste disposal and water ution problems as they apply to the coastal n and the Great Lakes. The coastal ocean is y polluted because it is shallow, has a complex tline geography which restricts water circula- has coastal currents parallel to the coastline h prohibits mixing, and has an estuarine-like ulation system which prevents little outflow the open ocean. Sources of coastal water pol-n are described, followed by a history of waste ution problems and sources of wastes in the US ary and secondary sewage waste treatment are ained. The problem of dredged wastes are ex-ed. Waste disposal effects on the great lakes lso of great concern and can be categorized as: ollution of inshore areas, harbors and tributa- (2) long-term changes in open water; and (3) term changes in sediments. New technology waste management programs are needed for suring wastes, restraining further dumping, and enting further pollution and environmental ioration of coastal and Great Lakes water. Entyre-PAI)
-08752

AN POLLUTION AND MARINE WASTE OSAL.
nical Engineering, Vol 78, No 3, p 60-67, Feb 71. 2 fig, 3 tab, 10 ref.

riptors: *Estuaries, *Water pollution sources, r pollution effects, Water quality, Waste treat-, Waste disposal.
ifiers: Ocean dumping.

inal resting place of almost all pollutants is the ocean. An overall examination of the various ices, problems, and constraints on marine sal is presented. The bulk of marine pollution ves the edges of the sea, with some 39 rine systems identified by the Federal Govern- as having degraded water quality. Marine ls have not had to develop protective systems st intense environmental changes such as caused by pollution, with the result that only fauna can survive. The marine pollutant ories discussed are: salinity; pH; temperature; ved oxygen; petroleum products; turbidity color; settleable solids; floating materials; ng substances; nutrients; nuisance organisms; oxic substances. A table is given showing in-al waste discharges, treated and untreated, in al states. Five recommendations and a table of s are given to be considered in designing a sal system to control process-plant pollution. and legislative aspects of the control of ocean ing are reviewed. (McEntyre-PAI)
08761

MARINE POLLUTION AND FISHERIES,
For primary bibliographic entry see Field 05G.
W71-08765

PESTICIDES AND PLOYCHLORINATED BIPHENYLS IN ESTUARIES,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W71-08772

NATURAL OIL SEEPS: HISTORICAL BACKGROUND,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08777

FECAL CONTAMINATION OF FRUITS AND VEGETABLES DURING CULTIVATION AND PROCESSING FOR MARKET, A REVIEW,
Environmental Protection Agency, Cincinnati, Ohio. Div. of Water Hygiene.
For primary bibliographic entry see Field 05A.
W71-08826

PULP MILL OUTFALL ANALYSIS BY REMOTE SENSING TECHNIQUES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
Wesley P. James, and Fred J. Burgess.
Journal of the Technical Association of the Pulp and Paper Industry, Vol 54, No 3, March 1971, p 414-418. 6 fig, 2 tab, 6 ref. EPA-WQO Program 16070 ENS.

Descriptors: *Waste water disposal, *Remote sensing, *Aerial photography, *Pulp and paper industry, Industrial waste, Sewage effluents, Oceans, Coasts, Outlets, Mixing, Diffusion, Currents (Water), Water pollution sources, Pollutant identification.

A remote sensing system involving aerial photography was utilized to estimate waste concentrations, water currents, and diffusion coefficients in ocean outfall plumes. Aerial photography of the waste field was taken with a multispectral camera system while boat sampling was conducted to provide 'ground truth' data. Data have been compiled and analyzed by a computerized procedure to relate water quality to photographic imagery. The photographic technique is more comprehensive than conventional boat sampling and permits waste concentrations to be measured throughout the plume in one instant. Discrepancies between concentrations determined by boat sampling and concentrations determined photographically appear to be due primarily to changing and shifting of the waste in this dynamic environment. (See also W71-08830 thru W71-08832) (James - Oregon State)
W71-08829

AN AERIAL PHOTOGRAPHIC STUDY OF WASTE FIELD FROM THREE OCEAN OUTFALLS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
Wesley P. James, Fred J. Burgess, and Don Baumgartner.
Offshore Technology Conference Proceedings, Houston, Texas April 19-21, 1971., Paper No OTC 1374, p 1483-1498. 17 fig, 4 ref. EPA-WQO Program 16070 ENS.

Descriptors: *Waste water disposal, *Remote sensing, *Aerial photography, *Pulp and paper industry, Industrial waste, Sewage effluents, Oceans, Coasts, Outlets, Mixing, Diffusion, Currents (Water), Water pollution sources, Pollutant identification.

Aerial photography is an effective tool in the study of ocean outfall waste disposal sites. Field studies were conducted on waste plumes from two outfalls in Oregon and one in northern California. Water currents, waste concentrations and diffusion coefficients were determined from the aerial photography. When the hydrography of the receiving water allowed the formation of a surface plume, the water current velocity was found to be the dominant factor in the resulting plume pattern. The steady state form of the Fickian diffusion equation with a unidirectional transport velocity was not applicable to the majority of the observations. (See also W71-08829) (James-Oregon State)
W71-08831

THE USE OF PHOTOGRAMMETRY IN PREDICTING OUTFALL DIFFUSION,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
Wesley P. James, and Fred J. Burgess.
National Council of the Paper Industry for Air and Stream Improvement, Technical Bulletin No 231, December 1969. 26 p, 14 fig, 1 tab. EPA-WQO Program 16070 ENS.

Descriptors: *Waste water disposal, *Remote sensing, *Aerial photography, *Pulp and paper industry, Industrial waste, Sewage effluents, Oceans, Coasts, Outlets, Mixing, Diffusion, Currents (Water), Water pollution sources, Pollutant identification.

Ocean outfalls are in general located in the relatively shallow coastal shelf. In this near-shore area sampling from a boat is impossible much of the time and dangerous at all times. As a result, conventional field study methods can only be used during a short period of the year. Aerial photography overcomes many of these difficulties and offers a possible method for studying dispersion of the waste from existing outfalls or evaluating possible locations for proposed outfalls throughout the year in any sea condition. Photographic techniques also provide a more comprehensive and detailed survey than the conventional procedures. Data collected in a fraction of a second with aerial photography would often require several days of continuous boat sampling. As the tide, wind and currents are continuously changing in outfall area, a survey conducted over an extended period of time does not represent the waste field at any instant but is only a composite of the various plume patterns during that period. (See also W71-08829) (James-Oregon State)
W71-08832

WATER QUALITY MODELLING WITH SUBMERSIBLE RECORDING WATER QUALITY AND CURRENT METERS,
Ontario Water Resources Commission, Toronto. Water Quality Surveys Branch.
For primary bibliographic entry see Field 05A.
W71-08887

MOVEMENT AND RECOVERY OF HERBICIDES IN THE OGALLALA AQUIFER,
Agricultural Research Service, Bushland, Tex. Soil and Water Conservation Research Div.
Arland D. Schneider, Allen F. Wiese, and Ordie R. Jones.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 219-226, 1970. 8 p, 1 fig, 3 tab, 4 ref.

Descriptors: *Path of pollutants, *Groundwater movement, *Injection wells, *Pesticides, Pesticide kinetics, DDT, Coliforms, Permeability, Pesticide removal, Absorption, Herbicides, Insecticides, Water pollution effects.
Identifiers: *Ogallala aquifer (Tex).

During the fall of 1969, water from an irrigation well was used to inject three common herbicides into a dual-purpose well in the Ogallala aquifer at the USDA Southwestern Great Plains Research Center, Bushland, Texas. Then, the well was pumped long enough to recover essentially all of

the recharged water. The dual-purpose well was recharged for 10 days at an average rate of 360 gpm. The herbicides, picloram, atrazine, and trifluralin, were continuously mixed with the recharge water at concentrations that averaged 0.125, 1.28 and 0.24 ppm, respectively. Nitrate, added in the form of sodium nitrate, was used to trace the movement of the recharged water. Water samples pumped from the observation wells at radial distances of 30 and 66 feet from the dual-purpose well showed that all three herbicides moved through the aquifer with the recharged water. The coliform bacteria and DDT were effectively filtered or absorbed by the fine Ogallala sand. (See also W71-08349 thru W71-08357 and W71-08570 thru W71-08575) (Knapp-USGS)
W71-08898

HYDROLOGIC EFFECTS OF STRIP MINING WEST OF APPALACHIA,
Geological Survey, Arlington, Va.
For primary bibliographic entry see Field 05C.
W71-08899

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES--PART 1: EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES,Quirk, Lawler and Matusky Engineers, New York.
Quirk, Lawler and Matusky Engineers, New York.
For primary bibliographic entry see Field 05G.
W71-08928

REAERATION IN OPEN-CHANNEL FLOW,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 08B.
W71-08936

5C. Effects of Pollution

HYDROBIOLOGICAL CHARACTERISTICS OF SHARK RIVER ESTUARY, EVERGLADES NATIONAL PARK, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02L.
W71-08329

SPARTINA 'DIE-BACK' IN LOUISIANA MARSHLANDS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
W. G. Smith.
Also published as Louisiana State Univ. Coastal Studies Inst. Technical Report no 91, Dec 1970. Louisiana State University Coastal Studies Bulletin no 5, p 89-96, Feb 1970. 8 p, 2 fig, 13 ref.Contract Nonr 1575 (03), Project ONR, Geog. Progm. Contract GH-47 NSF, Office of Sea Grant Programs.

Descriptors: *Marsh plants, *Tidal marshes, *Soil-water-plant relationships, *Plant pathology, *Louisiana, Saline water, Plant diseases, Tidal waters, Water pollution effects, Hydrogen sulfide, Drainage, Saturated soils.
Identifiers: *Spartina.

'Die-back' is a term applied to degeneration and death of large areas of Spartina townsendii marshes in England. What appears to be the same condition affects S. alterniflora marshes in Louisiana and possibly elsewhere in North America. Several factors that are likely to be involved include (1) excess salinity, (2) pathogenic organisms, (3) lack of available iron, (4) hydrogen sulfide toxicity, (5) change of tidal regime, and (6) pollution. (Woodard-USGS)
W71-08348

RESPIRATION OF AQUATIC MACROPHYTES IN EUTROPHIC ECOSTEMS,
Pennsylvania State Univ., University Parks. Dept. of Civil Engineering.
Archie J. McDonnell, and Dennis W. Weeter.
Available from the National Technical tion Service as PB-199 646, $3.00 in paper copy, $0.95 in microfich. Completion Report, Institute for Research on Land and Water Resources University Parks, Pa, Apr 1971, 74 p, 15 fig, 18 tab, 46 ref. OWRR Project B-016-PA (2).

Descriptors: *Eutrophication, *Aquatic plants, Oxygen, Productivity, *Respiration, Temperature, Nutrients, Dissolved oxygen, *Primary productivity.
Identifiers: Potamogeton crispus, Elodea Canadensis, Respirometers.

Extensive laboratory studies were conducted to evaluate on a seasonal basis the respiratory response of selected aquatic plants to changes in oxygen concentration, temperature, and exogenous nutrient additions. Sampling sites included (1) a nutrient rich stream section which received the effluent from a secondary sewage treatment plant and (2) an unenriched section supported solely by watershed drainage. Test species for the study, which was run in continuous flow and batch type respirometers, included the aquatic macrophytes Potamogeton crispus and Elodea canadensis. Consumption rates were found to be dependent on temperature, state of plant maturity, the oxygen concentration of the test water, and the level of enrichment at the growth site. Values of plant respiration rate at zero dissolved oxygen were observed to vary from 0.21 to 0.87 mg gm to the minus 1 power hr to the minus 1 power with corresponding values of respiration reactivity coefficient ranging from 0.04 to 0.09 lgm to the minus 1 power hr to the minus 1 power. Consumption rates varied from 0.2 to 2.8 mg Osub 2/gm dry weight/hr for dissolved oxygen concentrations of 0 to 18 mg/l. A methodology is presented to estimate primary productivity in aquatic ecosystems from observations of the diurnal variation of dissolved oxygen incorporating a variable community respiration rate.
W71-08394

NITROGEN IN AGRICULTURE: THE PROBLEMS AND THE EFFECT ON THE ENVIRONMENT,
Edinburgh Univ. (Scotland).
For primary bibliographic entry see Field 03F.
W71-08478

THE LIMNOLOGY OF HYPEREUTROPHIC LAKE BUTTE DES MORTS, WISCONSIN,
Wisconsin State Univ., Oshosh. Dept. of Biology; and Wisconsin Univ., Madison. Water Resources Center.
William E. Sloey.
Reprint, Proceedings 13th Conference, Great Lakes Research, 1970, 951-968, International Association Great Lakes Research, 1970, 18 p, 11 fig, 50 ref. OWRR Project A-011-WIS (3).

Descriptors: *Eutrophication, *Productivity, *Nutrients, *Lakes, *Phytoplankton, *Influent streams, Dissolved oxygen, Stratification, Limnology, Wisconsin.
Identifiers: *Hypereutrophic, *Winnebago pool, *Shallow reservoir, Nitrate, Phosphate, Melosira granulata, M. Ambigua, Stephanodiscus Hantschii, S. niagarae, *Lake Butte des Morts (Wisc).

Lake Butte des Morts is the mixing basin of the Fox and Wolf Rivers which together comprise the principle influent to Green Bay. The lake is a portion of the larger Winnebago Pool. The water is highly eutrophic--during 1967-68, C-14 productivity of the phytoplankton ranged to 5.2gC/sq m/day and averaged 1227 mgC/sq m/day during the ice-free period. The euphotic zone was only 1.11-1.40 m. Dissolved oxygen decreased to under 3 mg/l in less than 24 hours during temporary stratification. Nitrate ranged to 2.21 mg/l and phosphate to 0.39 mg/l. Suspended solids averaged 25-50 g/m3 during open water and phytoplankton volumes ranged to 110,000,000 cu microns/ml. The predominant phytoplankton were Melosira granulata, M. ambigua, Stephanodiscus Hantschii, S. niagarae, and typical nuisance blue-greens. The lake is presently undergoing a loss of littoral vegetation and should be considered hypereutrophic on the basis of phytoplankton production.
W71-08494

LAKE AND RIVER POLLUTION, AN ANNOTATED BIBLIOGRAPHY,
For primary bibliographic entry see Field 05B.
W71-08498

MERCURY IN THE ENVIRONMENT-THE HUMAN ELEMENT,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05B.
W71-08515

MERCURY ANALYSES AND TOXICITY: A REVIEW,
Teledyne Brown Engineering, Huntsville, Ala. Environmental Sciences; and Carnegie-Mellon Univ., Pittsburgh, Pa.
Robert A. Baker, and Ming-Dean Luh.
Water and Sewage Works, Vol 118, No 5, p IW/2-IW/29, May 1971. 9 p, 67 ref.

Descriptors: *Pollutants, *Heavy metals, *Bibliographies, *Environmental effects, *Water pollution, Air pollution, Reviews, Chemical analysis, Analytical techniques, Path of pollutants, Toxins, Toxicity, Chemical properties, Human pathology, Animal pathology.
Identifiers: *Mercury, Mercury poison, Antidote.

This review summarizes some of the known toxicological effects of mercurials and examines the various analytical procedures used in its identification and quantification. Perhaps the most devastating indictment of mercury pollution is its long-term persistence. The irreversible effects on adults and unborn children are an ever-increasing concern to public health specialists around the world. Treatment of mercury poisoning with 0.001 M solutions of cystein or glutalhione has produced almost instantaneous relief in selected cases. (Woodard-USGS)
W71-08517

NUTRIENT LIMITING FACTORS IN A OLIGOTROPHIC SOUTH CAROLINA POND,
Savannah River Ecology Lab., Aiken, S.C
J. M. Polisini, Claude E. Boyd, and Bonny Didge.
Oikos, Vol 21, No 2, p 344-347, 1970. 4 p, 1 fig, 1 tab, 7 ref. USAEC Contract AT (38-1)-310.

Descriptors: *Oligotropy, *Ponds, *Nutrients, *Bioassay, *South Carolina, Analytical techniques, Nitrates, Phosphates, Sulfates, Calcium, Rain, Sampling, Spectrophotometry, Eutrophication.
Identifiers: *Carbon-14 bioassay, Atomic absorption spectrophotometer.

Several small abandoned farm ponds are located on the U.S. Atomic Energy Commission Savannah River Plant near Aiken, South Carolina. These ponds have not been disturbed by human activity since closure of the reservation in 1952. Nutrient relationships were studied in a small oligotrophic pond. Dissolved nutrient levels were very low and marked seasonal changes in concentrations were not apparent. Rainfall nutrient input was large but comparatively small quantities of nutrients entered the pond in leaf fall. Light and dark bottle productivity estimates were very low. The carbon-14 bioassay technique revealed that sulfate was the only single nutrient capable of increasing primary productivity. Combinations of nitrate and phosphate increased productivity as much as nitrate, phosphate and sulfate. When calcium or potassium was

h these anions an additional increase in carbon- uptake was observed. (Woodard-USGS)
71-08543

E pH TOLERANCE OF EMBRYOS AND RVAE OF THE COOT CLAM, MULINIA TERALIS (SAY),
reau of Commercial Fisheries, Milford, Conn. logical Lab.
thony Calabrese.
Veliger, Vol 13, No 2, p 122-126. 2 fig, 1 tab, ref.

scriptors: *Oysters, *Silting, *Larval growth es, Hydrogen sulfide, Spawning, Sea water, ydrogen ion concentration, *Clams, Mollusks.
ntifiers: *Mulinia lateralis, *Crassostrea vir- ca, *Sulmet (sodium sulfamethazine), *Emb- nic development, Survival, Ostrea edulis, Coot n.

determine the effect of pH on embryonic elopment of Mulinia lateralis, fertilized eggs e placed in polypropylene beakers containing red, ultraviolet-treated sea water (27 plus or us 0.50/parts per thousand). In three experi- ts fertilized eggs were placed in beakers and pH of duplicate cultures was adjusted with HCl NaOH to levels ranging from 5.75 to 9.25 at -unit intervals. Three additional experiments e run to determine the effect of various pH ls on the survival and growth of larvae. Some ryos of Mulinia lateralis developed into normal ae from pH 6.25 to 8.75, but maximum elopment was satisfactory only within the range 7.25 to 8.25, and was highest at 7.75. Some ae survived from pH 5.75 to 9.00, but survival satisfactory only within the range from 6.50 to , and was highest at 7.25 to 7.50. Larvae grew factorily within the pH range from 7.00 to ; pH 7.25 was the optimum for growth. tello-Washington)
-08594

UAL BEHAVIORAL INTERPRETATION OF SINGLE ENVIRONMENTAL STIMULUS H FRESHWATER MUSSELS,
hwestern Univ., Evanston, Ill.
J. Imlay.
ual Reports for 1969 of the American cological Union, p 21-22. 7 ref.

riptors: *Mollusks, *Mussels, *Vibrations, nt, *Behavior, Clams, Shellfish, Water quality, quality, Habitats.
ifiers: *External stimuli, Elliptio sp., Am- a sp., Reaction, Stimuli.

gle stimulus may cause different successive ions in freshwater mussels. An immediate sive closing is often followed within an hour ening, i.e., after danger is diminished. This is ially true when light changes serve as the li, and to a lesser degree when the stimulus is tion. Two species, Elliptio complanatus and ema plicata opened after gentle water ge. (LeGore-Washington)
08595

NSFER OF TOXIC ALGAL SUBSTANCES ARINE GOOD CHAINS,
ii Univ., Honolulu. Dept. of Botany.
ell S. Doty, and Gertrudes Aguilar-Santos.
c Science, Vol 24, p 351-355, July 1970. 1 tab, 11 ref. USPHS Grant No FD-00101-03, Grant No 5-R01-GM-151-98-03, AEC Con- No AT (04-3)-235.

iptors: *Food webs, *Food chains, *Toxicity, l toxins, *Chlorophyta, *Phytotoxins, Ecolo- sh food organisms, Path of pollutants, Bioas- oxins, Poisons, Poisonous plants, Coral, In- rates, Algae, Marine algae, Algal poisoning, natography, Chemical analysis, Biochemistry, physiology, Biological communities.

Identifiers: *Ciguatera, Caulerpa sp., Caulerpicin, Caulerpin, Palmitic acid, Beta-sitosterol, Thin-layer chromatography.

Alcoholic and ether extracts of obligate herbivores, omnivores and detritus feeders common on Caulerpa or in its communities were sometimes found by thin-layer chromatography to contain varying amounts of caulerpicin, caulerpin, palmitic acid, and beta-sitosterol. Cerithium and soft corals, which may be either omnivorous or carnivorous, on occasion contain caulerpicin. The crustacean detritus feeders did not seem to preserve either caulerpicin or caulerpin. Caulerpicin and caulerpin, which, as produced by Caulerpa are physiologically active and toxic to rats and to mice, are apparently transferred along the food chains and concentrated in at least some herbivores. (LeGore-Washington)
W71-08597

MARINE FOULING IN POWER STATIONS,
Central Electricity Generating Board, Southampton (England). Marine Biological Lab.
For primary bibliographic entry see Field 05D.
W71-08598

MUSSEL FOULING IN CHLORINATED COOLING SYSTEMS,
Central Electricity Generating Board, Southampton (England). Marine Biological Lab.
For primary bibliographic entry see Field 05D.
W71-08599

RECOVERY OF SALT MARSH IN BRITTANY SIXTEEN MONTHS AFTER HEAVY POLLUTION BY OIL,
Nature Conservancy, Norwich (England). Coastal Ecology Research Station.
R. E. Stebbings.
Environmental Pollution, Vol 1, p 163-167, 1970. 3 ref.

Descriptors: *Oily water, *Water pollution effects, *Marshes, *Coastal marshes, *Salt marshes, *Marsh plants, *Soil gases, Oil, Oil wastes, Surveys, Oil-water interfaces, Vegetation establishment, Plant groupings, On-site investigations, On-site data collections, Soil investigations, Tidal marshes, Intertidal area, Water pollution, Soil contamination effects, Aesthetics, Photosynthetic oxygen, Root development.
Identifiers: *Oil spills, Chlorosis, Salicornia sp., Beta sp., Spartina sp.

Oil was stranded at Cotes du Nord, Britanny in April, 1967 after drifting at sea for 14-18 days. The long drift period enabled the more volatile fractions to dissipate before stranding. The effects were observed of the oil on two marshes 14 days thereafter, and again 16 months later. Oil was originally deposited 2-5 cm deep over the marshes with frequent deeper pools to 10 cm. It was viscous and stuck thickly to vegetation. Sixteen months later, most salt marsh plant species survived all but the heaviest contamination, with the exceptions of Salicornia perennis and Beta maritina. Oil appeared to prevent gaseous interchange between soil and air, yielding reducing conditions, leading to chlorosis in plants. Vegetative reinvasion occurred in cracks of drying oil layers. Specification of the type oil involved may have rendered the observations more valuable, but crude oil is assumed in the absence of this detail. (LeGore-Washington)
W71-08600

ACCUMULATION OF DDT RESIDUES IN TRIPHOTURUS MEXICANUS FROM THE GULF OF CALIFORNIA,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
James L. Cox.
Nature. Vol 227, No 5254, p 192-193, July 11, 1970. 1 fig, 1 tab, 11 ref. NSF Grant.

Descriptors: *DDT, *Gas chromatography, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Fish physiology, Water pollution effects, Diffusion, Fish food organisms, Food chains, Path of pollutants.
Identifiers: *DDE, Triphoturus sp., Concentration, Biological concentration, Fish gills, Gulf of California.

In an attempt to obtain size-class data about concentrations of pesticide residues, relatively free of pesticide 'hot spots,' Triphoturus mexicanus, a midwater fish from an area remote from areas of pesticide application, was chosen for analysis by gas chromatography. DDT concentrations ranged from 13 to 79 ppb. The controversy concerning the importance of diffusive loss of pesticide residues across gill membranes is discussed. An increase in total residue and DDE concentrations with fish body weight was found. This evidence tends to minimize the importance of residue loss by diffusion, because no apparent equilibrium is established. (LeGore-Washington)
W71-08601

STUDIES ON ACCUMULATION OF HEAVY METALS IN AQUATIC ORGANISMS--IV. ON DISAPPEARANCE OF ABNORMALLY ACCUMULATED COPPER AND ZINC IN OYSTERS. (IN JAPANESE),
Miyazaki Univ., Miyazaki (Japan). Faculty of Agriculture.
Ikuta Kunio.
English summary. Bulletin of the Japanese Society of Scientific Fisheries, Vol 34, No 6, p 482-487, June 1968. 7 fig, 3 tab, 8 ref.

Descriptors: *Heavy metals, *Copper, *Oysters, *Public health, *Self-purification, Metals, Water pollution effects, Shellfish, Mollusks, Bioassay, Environmental sanitation, Human diseases.
Identifiers: *Zinc, *Depuration, Japan.

Oysters containing abnormally high levels of copper and zinc were transplanted to a normal oyster growing area, and depuration of the metals was observed. Excretion of the accumulated Cu does not begin until two weeks or longer after transplantation, while the Zn begins to disappear immediately. Once begun, however, Cu levels decrease at greater than twice the rate that Zn is eliminated. The metal contents of the oysters and the Zn:Cu ratio fell to normal within 116 days. (LeGore-Washington)
W71-08603

DYNAMICS OF ENDRIN UPTAKE AND RELEASE BY RESISTANT AND SUSCEPTIBLE STRAINS OF MOSQUITOFISH,
Mississippi State Univ., State College. Dept. of Zoology.
Denzel E. Ferguson, J. Larry Ludke, and George G. Murphy.
Transactions of the American Fisheries Society, Vol 95, No 4, p 335-344, Oct 1966. 8 tab, 17 ref. PHS Grant No ES 00086-01.

Descriptors: *Water pollution effects, *Endrin, *Pesticide toxicity, *Chlorinated hydrocarbon pesticides, *Resistance, Pesticide residues, Absorption, Bioassay, Fish physiology, Mortality, Pollutants, Water pollution sources, Lethal limit, Poisons, Toxins, Toxicity, Fish diseases, Fishkill, Runoff.
Identifiers: *Mosquitofish, *Gambusia sp., TL-m, Farm runoff, Cotton fields.

Laboratory bioassays indicated that mosquitofish, Gambusia affinis, from near heavily-treated cotton fields (36 hr TL-m — 1,000 ppb) and from an uncontaminated site (36 hr TL-m — 1 ppb) remove endrin from static test solutions at the same rate. A 500 ppb endrin solution produced 32% mortality in 50 susceptible fish in 25 min, but required 144 hr in resistant fish. About six times as much endrin is taken up via the exposed head region as is taken up by the general body surfaces. Oxygen requirements

of the two populations are similar, but increase for susceptible fish at low endrin concentrations, and for resistant fish at high concentration coincident with the appearance of symptoms of endrin poisoning. A single resistant female, exposed to 1,000 ppb endrin, released sufficient endrin in 10 liters of water to kill five susceptible fish in 38.5 hr and survived the experience. The mechanism of resistance is physiological toleration of massive endrin accumulations, but is is not known how the toxic effects of endrin are avoided. (LeGore-Washington)
W71-08604

FISH KILL CAUSED BY AN INTERMEDIATE OIL FROM COKE OVENS,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
V. Zitko, and S. N. Tibbo.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 1, p 24-25, 1971. 1 ref.

Descriptors: *Oil, *Fishkill, *Mortality, *Water pollution effects, *Herrings, *Lethal limit, *Fish toxins, *Toxicity, Oily water, Oil wastes, Fish physiology, Fish diseases, Chromatography, Bioassay.
Identifiers: *Oil pollution, Coke, Coke production.

A mass mortality of herring occurred in North Sydney Harbor, Nova Scotia, Canada in April, 1969. Dead fish were examined, and skin muscle and intestines were found to contain, respectively, 17.5, 5.2 and 9.2 ug of the suspected oil per gram wet weight. Bioassays indicated LT-50 values (time to 50% mortality in hours) of 0.25, 0.87, 3.7 and 93.0 at 100, 10, 8 and 6 ppm of oil, respectively. The detection of the oil in dead herring and the high toxicity of the oil to herring under laboratory conditions indicate that this intermediate oil caused the fish kill. The distribution of the oil in the tissues shows that the oil was taken up primarily through the body surface. (LeGore-Washington)
W71-08605

REHABILITATION OF OILED BIRDS IN MASSACHUSETTS,
Wildlife Rehabilitation Center, Upton, Mass.
Philip B. Stanton.
Marine Pollution Bulletin, Vol 1 (NS), No 9, p 134-135, Sept 1970.

Descriptors: *Water pollution effects, *Water pollution treatment, *Oily water, *Cleaning, *Treatment, Bufflehead Duck, Ducks (Wild), Gulls, Waterfowl, Oil wastes, Oil, Detergents, *Rehabilitation.
Identifiers: *Oil pollution, *Polycomplex A-11, Eiders, Mergansers, Scoters, Scaup, Gannets, Terns.

Polycomplex A-11 is recommended, at 1-2 parts per 100 parts of water, for cleaning oil from birds. The considerations of shelter, drinking water, food, medication, extended care, and ultimate release are discussed. Procedures outlined are not a complete solution to the problems of bird rehabilitation, but considerable success has been enjoyed. (LeGore-Washington)
W71-08607

RECOGNITION OF BUNKER OILS BY THIN-LAYER CHROMATOGRAPHY,
Fisheries Research Board of Canada, Halifax (Nova Scotia).
For primary bibliographic entry see Field 05A.
W71-08608

MERCURY CONTENT OF VARIOUS BOTTOM SEDIMENTS, SEWAGE TREATMENT PLANT EFFLUENTS AND WATER SUPPLIES IN WISCONSIN (A PRELIMINARY REPORT),
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05B.
W71-08609

MERCURY LEVELS IN FISH FROM SELECTED WISCONSIN WATERS (A PRELIMINARY REPORT),
Wisconsin Dept. of Natural Resources, Madison.
Stanton J. Kleinert, and Paul E. Degurse.
Research Report 73, 1971. 16 p, 1 fig, 3 tab, 15 ref.

Descriptors: *Heavy metals, *Stream pollution, *Path of pollutants, *Public health, Wisconsin, Industrial wastes, Environmental sanitation, Water pollutioneffects, Pulp wastes, Chemical wastes, Walleye, Suckers, Catfishes, Sunfishes, Yellow perch, Fish, Fish physiology, Lake Michigan, Lake Superior, Mississippi River.
Identifiers: *Mercury pollution, *Bioconcentration, Concentration, Mercury, Redhorse fish, Crappie, Green Bay Wisconsin.

Mercury determinations were made on fish filet samples from throughout Wisconsin and from Wisconsin's boundary waters of Lake Michigan, Green Bay, Lake Superior and the Mississippi River. All Wisconsin fish analyzed contained some mercury, with a range of 0.01 to 0.60 ppm, and an average of 0.19 ppm. The highest mercury levels, averaging 0.80 ppm, and ranging from 0.06 to 4.62 ppm, occurred in fish taken from below paper mills and from below a mercury cell chlor-alkali plant. Different species vary in mercury content, and the larger fish often contain higher concentrations than do smaller fish of the same species taken from the same water. Walleye, sucker, redhorse, crappie and bullhead frequently showed higher mercury concentrations, while the panfishes showed lower concentrations. It is essential, therefore, that mercury levels in all important species in the fishery be determined before the potential pollution problem can be adequately assessed. (LeGore-Washington)
W71-08610

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON DISTRIBUTION OF BOTTOM ORGANISMS IN EL CAPITAN RESERVOIR,
California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
For primary bibliographic entry see Field 05G.
W71-08611

INFLUENCES OF HIGH TEMPERATURE AND RESIDUAL CHLORINE ON THE MARINE PLANKTONIC LARVAE (IN JAPANESE),
Nagasaki Univ., (Japan). Faculty of Fisheries.
Kazutsugu Hirayama, and Reijiro Hirano.
English summary. Bulletin of the Faculty of Fisheries, Nagasaki University, No 29, p 83-89, Aug 1970. 1 fig, 4 tab, 4 ref.

Descriptors: *Chlorination, *Lethal limit, *Thermal pollution, *Water pollution effects, *Larvae, *Heat resistance, Chlorine, Poisons, Toxicity, Bioassay, Heated water, Water temperature, Water utilization, Oysters, Mortality, Cooling water.
Identifiers: TL-m, Crassostrea gigas, Mytilus edulis, Balanus sp., Anthocidaris sp., Sea urchins, Barnacles.

Some biological effects of brief exposure to high temperature and to dissolved chlorine were determined to simulate the environmental danger presented by use of industrial cooling water. Temperature bioassays were conducted against 2-4 cell, blastula and pluteus stages of the sea urchin (Anthocidaris crassipina), against nauplii of the rock barnacle (Balanus amphitrite albicostatus), and against the blastula stage of the oyster (Crassostrea gigas). Trochophore and 2-4 cell larvae of the mussel, Mytilus edulis, were exposed to the chlorine. Young sea urchin larvae are least tolerant to heat, being unable to survive a 20 min exposure to 33 C. Nauplius II barnacle larvae are most tolerant, surviving a 40 min treatment at 40 C. The 10 min TL-m values for 2-4 cell and for trochphore mussel larvae are 1.15 and 1.31 ppm, chlorine in water, respectively. The 5 min TL-m increased from 1.21 ppm chlorine for 2-4 cell mussels to 2.37 ppm chlorine for trochophore mussel larvae. (LeGore-Washington)
W71-08613

INFLUENCES OF HIGH TEMPERATURE AND RESIDUAL CHLORINE ON MARINE PHYTOPLANKTON,
Nagasaki Univ., (Japan). Faculty of Fisheries; and
Tokyo Univ., (Japan). Faculty of Agriculture.
K. Hirayama, and R. Hirano.
Marine Biology, Vol 7, No 3, p 205-213, Nov 1970. 10 fig, 5 tab, 3 ref.

Descriptors: *Chlorination, *Lethal limit, *Thermal pollution, *Water pollution effects, *Chlamydomonas, *Heat resistance, Chlorine, Poisons, Toxicity, Bioassay, Heated water, Water temperature, Water utilization, Mortality, Cooling water, Photosynthesis, Primary productivity, Phytoplankton, Inhibition, Resistance.
Identifiers: *Skeletonema sp., *Photosynthetic inhibition, Temperature shock, Acute exposure.

The direct influence of high temperature and residual clorine on growth and photosynthesis of Chlamydomonas sp. and Skeletonema costatum were investigated experimentally. Chlamydomonas sp. and S. costatum exposed to high temperatures were affected in their growth from 43 C and 35 C respectively, by immersion of the respective cultures in a warm bath for 10 min. Exposure to high temperatures of 40 C and 34-35 C for 10 min influenced their photosynthetic activities, which were completely inhibited immediately after 10 min exposure to 42 C and 37 C, respectively. S. costatum was killed by chlorine at a concentration of 1.5-2.3 ppm when exposed for either 5 or 10 min, while Chlamydomonas sp. was not irreversibly damaged even at 20 ppm chlorine or more with the same exposure period. The high temperature and residual chlorine in, effluents from a power plant discharging into the open sea, should cause great damage to marine phytoplankton in that area. (LeGore-Washington)
W71-08615

CHRONIC TOXICITY, UPTAKE, AND RETENTION OF AROCLOR 1254 IN ESTUARINE FISHES.
Environmental Protection Agency, Gulf Breeze, Fla. Gulf Breeze Lab.
D. J. Hansen, P. R. Parrish, J. I. Lowe, A. J. Wilson, Jr., and P. D. Wilson.
Gulf Breeze Contribution No 120. Bulletin of Environmental Contamination and Toxicology, Vol 6, No 2, p 113-119, 1971. 2 tab, 11 ref.

Descriptors: *Water pollution effects, *Pesticides, *Bioassay, *Chlorinated hydrocarbon pesticides, DDT, Mortality, Poisons, Gas chromatography, Lethal limit, Laboratory tests.
Identifiers: *Polychlorinated biphenyls, *Aroclor 1254, *Chronic exposure, PCB, Lagodon rhomboides, Leiostomus sp., Long-term bioassay, Pinfish, Spot (Fish).

Some effects of the polychlorinated biphenyl (PCB) mixture, Aroclor 1254 (Monsanto Co, St. Louis, Mo.), on the pinfish (Lagodon rhomboides) and the spot (Leiostomus xanthurus) were determined in laboratory bioassay. Previous work indicated that PCB is not acutely toxic to juvenile pinfish. This work indicates, however, that both species of fish died (41-66% mortality) when exposed for 14-45 days to 5 ppb of Aroclor 1254. Spot appeared unaffected by 1.0 ppb for up to 45 days. Chronic exposure to Aroclor 1254 appeared to increased susceptibility of test pinfish and spot to disease, and also appeared toxic. This PCB was rapidly stored by these fish, and persists in tissues for about three months. (LeGore-Washington)
W71-08616

POLYCHLORINATED BIPHENYL (AROCLOR 1242): EFFECTS OF UPTAKE ON GROWTH, NUCLETIC ACIDS, AND CHLOROPHYLL IN A MARINE DIATOM,
Medical Univ. of South Carolina, Charleston. Preventive Medicine Section; and South Carolina Board of Health, Columbia. Environmental Health Labs.
Julian E. Keil, Lamar E. Priester, and Samuel Sandifer.

lletin of Environmental Contamination and Tox-
logy, Vol 6, No 2, p 156-159, 1971. 1 tab, 8 ref.
H General Research Support Grant 5420.

scriptors: *Water pollution effects, *Inhibition,
ytotoxicity, *Bioassay, *Chlorinated hydrocar-
pesticides, Pesticide toxicity, Poisons,
tosynthesis, Diatoms, Chlorophyll, Gas chro-
ography.
ntifiers: *Polychlorinated biphenyls, *Aroclor
2, PCB, Cylindrotheca sp., Plant growth inhibi-
, RNA synthesis, DNA synthesis, Chlorophyll
hesis.

ne effects of the polychlorinated biphenyl
B) mixture, Aroclor 1242 (Monsanto Co., St.
is, Mo.), on the metabolism of the marine
om, Cylindrotheca closterium, were deter-
ed in laboratory bioassay. PCB was taken up by
diatoms and concentrated up to 1100 times
ve levels added to the culture medium. The
er medium level of PCB (0.1 ppm) sharply in-
ted growth, as evidenced by harvest weights
cell counts. The 0.1 ppm dosage also signifi-
ly reduced RNA synthesis and the chlorophyll
x, but apparently had no effect on DNA levels.
at 0.01 ppm in the medium did not seem to ad-
ely affect growth or seriously alter nucleic acid
s or chlorophyll production. (LeGore-
hington)
-08617

**ONSTANT FLOW DELIVERY DEVICE FOR
RONIC BIOASSAY,**
orado State Univ., Fort Collins. Dept. of
ery and Wildlife Biology.
ert A. Freeman.
sactions of The American Fisheries Society,
100, No 1, p 135-136, Jan 1971. 2 fig. Federal
er Quality Admin Grant.

riptors: *Bioassay, *Laboratory equipment,
oratory tests, Assay, Water pollution effects,
al limit, Toxicity.
tifiers: *Bioassay equipment, *Dispensing
pment, Bioassay techniques.

w cost, mechanically simple device for deliver-
predetermined amounts of solution over ex-
ed periods has been developed for flow-
igh bioassay experiments. The device works
e siphoning principle, with a float holding the
nsing end of the siphon at a constant level
ve to the surface of the fluid being dispensed.
rates greater than 15 ml/min work well, and
r flow rates can be acquired by use of smaller
nal diameter tubing than the prescribed 2mm.
gal drum serves as the reservoir, although
thylene drums have since been found superior
ublished communication). Because the meter-
levice ceases to function below the 35 liter
a working volume of about 180 liters is rou-
provided. At a 20 ml/min flow rate, this
y lasts more than six days. (LeGore-Washing-

-08618

**ORPTION AND RETENTION OF ORGANIC
CURIALS BY RAINBOW TROUT AND
OOK AND SOCKEYE SALMON,**
au of Sport Fisheries and Wildlife, Seattle,
. Western Fish Disease Lab.
rt R. Rucker, and Donald F. Amend.
Progressive Fish Culturist, Vol 31, No 4, p
01, Oct 1969. 6 tab, 1 ref.

riptors: *Rainbow trout, *Chinook salmon,
keye salmon, *Metals, Bioassay, Water pollu-
effects, Environmental sanitation, Impaired
quality, Path of pollutants, Public health,
iseases.
ifiers: *Mercury pollution, *Pyridyl mercuric
te, *Ethyl mercury phosphate, Bacterial gill
es, Bioconcentration.

ate of absorption and excretion and the sites
ention in rainbow trout exposed to ethyl mer-
phosphate and pyridyl mercuric acetate were studied. Young chinook salmon were fed fingerlings that had been bathed in ethyl mercury phosphate. The concentrations of mercury in the gills, blood, liver and kidney of the salmon and trout were determined. The mercurials were absorbed and retained by fish in some tissues for periods up to 28 weeks after exposure. (Katz-Washington)
W71-08619

POTENTIAL TOXICITY OF KRAFT MILL EFFLUENT AFTER OCEANIC DISCHARGE,
Oregon State Univ., Corvallis. Engineering Experiment Station; and Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
Robert C. Courtright, and Carl E. Bond.
The Progressive Fish Culturist, Vol 31, No 4, p 207-212, Oct 1969. 5 fig, 3 tab, 6 ref. FWPCA Grant no WP-524.

Descriptors: Pulp wastes, *Water pollution effects, *Toxicity, *Sculpins, *Lethal limit, Marine fish, Mussels, Bioassay, Resistance, Pulp and paper industry, Industrial wastes.
Identifiers: *Kraft mill effluents, *Foam, Fluffy sculpins, TL-m, Median tolerance limits.

Toxicity bioassays were conducted with the marine species, fluffy sculpin, and the larvae of mussels to determine the toxicity of foamed kraft mill effluent. The foamed effluent was five times more toxic than the whole waste before discharge into the salt water. The sculpins can survive in toxic concentrations for a longer period in cool water (16 C) than in warm water (28 C). The 64 hr median tolerance limit (TL-m) at 18 and 30 parts per thousand salinity was about 9% of the kraft mill effluent foam. (Katz-Washington)
W71-08620

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT (DEC. 1, 1970 TO MARCH 1, 1971),
New York Operations Office (AEC), N.Y. Health and Safety Lab.
E. P. Hardy.
Available from NTIS HASL-242. HASL-242, Apr 1, 1971, 325 p.

Descriptors: *Bibliographies, *Data collection, *Theoretical analysis, *Radioactivity techniques, Potable water, Carbon radioisotopes, Radioactivity, Milk, Food chains, Strontium, Radioisotopes, Fallout, Atmosphere, Carbon dioxide, Ocean circulation.
Identifiers: Cesium radioisotopes.

The initial section consists of interpretive reports covering natural radioactivity, strontium-90 in bone of three population groups in South Africa, radiocarbon in the sea, fallout of trace metals in New York City, quality of gamma spectral analysis, strongium-90 yield of the Sept. 1969 Chineses nuclear test, and strontium-90 in the New York City and San Francisco diet. Subsequent sections include tabulations of radionuclide levels in surface air, stratospheric air, fallout, milk, other diet components and tap water. (See also W71-08650) (Bopp-ORNL)
W71-08649

STUDIES OF THE NATURAL ALPHA-EMITTING RADIOISOTOPES IN MARINE ORGANISMS,
Washington, Univ., Seattle.
Thomas M. Beasley.
Available from NTIS RLO-2225-F-14-1. RLO-2225-T-14-1, Dec 1970. 46 p, 1 fig, 7 tab, 50 ref. AEC Contract AT (45-1)-2225.

Descriptors: *Radioisotopes, *Absorption, *Aquatic population, *Lead radioisotopes, Zooplankton, Crustacean, Benthic fauna, Bottom fish, Saline water fish, Brackish-water fish, Freshwater fish, Trace elements.
Identifiers: *Polonium radioisotopes, Iron radioisotopes.

Tissues from organisms (zooplankton, pelagic fishes, and benethic organisms) were analyzed for polonium-210, lead-210, and stable lead. Polonium-210 increased from codepods to euphausiids and from mysids to pelagic fishes, but lead-210 decreased through the same chain. Polonium-210 was lowest in late spring and summer. Although levels were not considered toxic in fish protein concentrates, ingestion of normal amounts would substantially increase dietary levels of polonium-210, lead-210, cobalt and lead. The increase in uptake would be less important for silver, cadmium, copper, iron, zinc, and manganese. Blood from residents of Rongelap Atoll showed unusually high body burdens of iron-55. (Bopp-ORNL)
W71-08654

TRANSFER OF TRITIUM TO MAN FROM AN INITIAL WET DEPOSITION,
Oak Ridge National Lab., Tenn.
M. J. Kelly, and R. S. Booth.
Available from NTIS ORNL-TM-3134. ORNL-TM-3134, Jan 1971. 22 p, 8 fig, 5 ref. AEC Contract W-7405-eng-26.

Descriptors: *Tritium, *Soil contamination effects, *Nuclear explosions, Rainout, Food and cover crops, Radioactivity effects, Potable water, Rainfall, Soil water movement.

The total dose to man was estimated from a given wet deposition of tritium taking into account subsequent rainfall which tends to decrease the dose by dispersing the tritium deep into the soil. Except for the desert, the time-dependent concentration of tritium in soil is primarily determined by the rainfall after deposition and is nearly independent of the assumed depth of the soil compartment. A mathematical model was employed which was tested qualitatively against experimental results. (Bopp-ORNL)
W71-08655

ECOLOGY OF ANIMAL COMMUNITIES,
Johns Hopkins Univ., Baltimore, Md. School of Hygiene and Public Health.
Brenda K. Sladen.
IN: Biology of Populations, The Biological Basis of Public Health, New York, American Elsevier Publishing Co., 1969, p 87-100.

Descriptors: *Radioecology, *Aquatic populations, *Strontium radioisotopes, Productivity, Food webs, Life cycles, Lakes, Cycling nutrients, Energy transfer.

Accumulation of radionuclides demonstrated aquatic animal community interrelationships. A Canadian lake contained radionuclides seeping from a liquid waste disposal area. Biological activity during the warmer months depleted the nuclide levels. Strontium-90 in perch bones reached a constant after 5 years, and after 2 years or less in shorter lived animals. Cycling from species to species was followed. Strontium-90 concentration was 3,000 to 3,500 times greater in perch and muskrat bones than in water. Ecological concepts which are considered include succession, cycling, energy flow, and food webs. (Bopp-ORNL)
W71-08656

ANNUAL REPORT FOR 1970 TO THE USAEC, DIVISION OF BIOLOGY AND MEDICINE, VOLUME 1 LIFE SCIENCES, PART 2 ECOLOGICAL SCIENCES.
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.

Available from NTIS BNWL-1550 (Vol) (Pt 2). BNWL-1550, Vol. I, Part 2, Mar 1971. About 110 p. UC-48, Biology and Medicine.

Descriptors: *Ecology, *Environmental effects, *Radioactivity effects, Thermal stress, Nuclear powerplants, Tritium, Zinc radioisotopes, Strontium radioisotopes, Cesium, Soils, Predation, Food chains, Columbia River, Deserts, Arctic, Soils, Biota.

Identifiers: Cesium radioisotopes.

Characterization of functional roles and responses to disturbances of plants and animals is emphasized in the terrestrial program. The ALE Reserve, Alaska, Antartica, and both riparian and dessert communities near Hansford are included in the environments being studied. Determination of effects of man-made stress on aquatic environments is emphasized in the aquatic program. The effects of thermal increments and radiation are delineated and predicted. Base line studies on primary productivity, growth, and rates of transfer of essential elements are important for measurement of the sublethal effects of these stress factors. (See also W71-08658 and W71-08659) (Bopp-ORNL)
W71-08657

ECOLOGIC CHARACTERISTICS OF THE COLUMBIA RIVER. FRESHWATER ECOLOGY OF RATTLESNAKE SPRINGS. RATES AND MECHANISMS OF BIOGEOCHEMICAL PROCESSES OF THE COLUMBIA RIVER,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
R. E. Wildung, R. L. Schmidt, C. E. Cushing, C. D. Becker, and D. G. Watson.
BNWL-1550, Vol. I, Part 2, Mar 1971, p 2.1-2.10, 2 fig, 3 tab, 9 ref.

Descriptors: *Suspended load, *Aquatic productivity, *Bioassy, *Radioactivity effects, Zinc radioisotopes, Periphyton, Freshwater fish, Cycling nutrients, Food web, Chemical analysis, Dissolved oxygen, Carbon dioxide, Hydrogen ion concentration, Thermal stress, Columbia River, Biota, Cation adsorption, Montmorillonite, Illite, Silicates, Primary productivity.

Transfer rates of radionuclides and stable elements are being investigated in aquatic systems. Several related aspects of primary productivity are being studied, for example, in relation to soil particle-water exchanges, and in relation to plant and animal structure in the ALE Rexerve ecosystem. An understanding of the interaction between water, suspended materials, and the biota is necessary because thermal stress effects, for example on the periphyton community, can ultimately affect fish. (See also W71-08657) (Bopp-ORNL)
W71-08658

FIXATION AND LONG-TERM ACCUMULATION OF TRITIUM IN AN EXPERIMENTAL AQUATIC ENVIRONMENT AND EFFECTS OF SHORT RANGE PARTICLE IRRADIATION ON EMBRYOGENESIS OF MARINE TELEOST FISH,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
J. A. Strand, W. L. Templeton, E. G. Tangen, and P. A. Olson.
BNWL-1550, Vol. I, Part 2, Mar 1971, p 2.36-2.40, 2 fig, 1 tab.

Descriptors: *Tritium, *Embryonic growth stage, *Marine fish, Nuclear powerplant, Food web, Aquatic environment, Absorption, Water pollution, Environmental effects, Radioactivity effects, Water pollution effects.

Tritium as tritiated water will be a major contributor to the radioactivity in the effluents from nuclear power plants, and it cannot be removed by conventional technology. Two new research programs were initiated to determine the ultimate concentration in and its effect upon segments of the aquatic ecosystem. Experiments on the aquatic food web have just commenced, in which tritiated water is introduced into an ecosystem at a concentration of 1.0 microCi/l. In the other groups of experiments, preliminary consideration of data indicates no significant degree of detriment in embryogenesis, as resulting from exposure to levels of 0.01, 0.1 and 1.0 microCi/ml of tritium. However the present effort treats only a portion of the early life stages. Longer term studies will be necessary to investigate the problem fully, to examine first embryonic mitosis (four-cell blastomere stage), and to examine time of reabsorption of yolk sac. (See also W71-08657) (Bopp-ORNL)
W71-08659

THE ECOLOGY OF THE SECOND TROPHIC LEVEL IN LAKES SUPERIOR, MICHIGAN AND HURON,
Minnesota Univ., Minneapolis. School of Public Health.
W. R. Swain, T. A. Olson, and T. O. Odlaug.
Available from the National Technical Information Service as PB-199 938, $3.00 in paper copy, $0.95 in microfiche. Minnesota Water Resources Research Center, Bulletin 26, Oct 1970. 151 p, 95 fig, 43 tab, 85 ref. OWRR Project A-011-MINN (10).

Descriptors: *Tropic level, *Lake Superior, *Lake Michigan, *Lake Huron, *Plankton, Ecology, Zooplankton, *Eutrophication, Organisms, Aquatic environment, Limnology, Vertical migration, Biogeography, Phytoplankton, Crustaceans.
Identifiers: *Continuous plankton recorder, Multi-depth plankton indicator, Two-net technique, Grit gauze, Silk bolting cloth.

A series of lake-long transect tows were made with the Continuous Plankton Recorder in Lakes Superior, Michigan and Huron, 1966-68. All tows were made at ten meters depth with either no. 60 mesh Grit Gauze or no. 15 mesh Silk Bolting cloth. Information was obtained on organism distribution in both space and time. The density and distribution of ecologically related groups in plankton indicate the relative tropic status of the bodies of water sampled. Lake Superior is the most oligotrophic, Lake Huron the most eutrophic and Lake Michigan more mesotrophic. A mean of 200 to 300 organisms per section was seen in Lake Superior; a range of 5,000 to 6,000 organisms per section was seen in Lake Michigan and from 20,000 to 21,000 organisms were observed from one year to another and from one season to another. Marked variations in both numbers and species of organisms were evident in the lakes. Limitations of the Continuous Plankton Recorder method are described. (Walton-Minnesota)
W71-08665

DETERMINATION OF THE FEASIBILITY OF REMOVAL OF ALGAL NUTRIENTS IN LAKE WATER BY ION EXCHANGE,
Massachusetts Univ., Amherst. Water Resources Research.
For primary bibliographic entry see Field 05G.
W71-08669

LAKE MINNETONKA: NUTRIENTS, NUTRIENT ABATEMENT, AND THE PHOTOSYNTHETIC SYSTEM OF THE PHTOPLANKTON,
Minnesota Univ., Minneapolis. Limnological Research Center.
Robert O. Megard.
Available from the National Technical Information Service as PB-199 915, $3.00 in paper copy, $0.95 in microfiche. Final Report, Dec 1970. 210 p, 21 fig, 10 tab, 41 ref, 3 append. OWRR Project A-016-MINN (4).

Descriptors: *Limnology, *Lakes, *Photosynthesis, *Phytoplankton, *Productivity, Algae, Nitrogen, Phosphorus, Mathematical models, Nutrients, Measurement, Population, Chlorophyll, Water pollution effects, Temperature, Carbon, Diatoms, Light, Oxygen, Minnesota.
Identifiers: *Lake Minnetonka (Minn).

Density of planktonic algae, rates of photosynthesis, nutrient concentrations, and other limnological characteristics were recoded during 1968-1970 in different parts of Lake Minnetonka, Minn. In the course of the past 30 years, the density of algae increased 2 or 3 times, and the dominance of diatoms was replaced by that of blue-green algae. A linear relationship was disclosed between the algae dens
ty and the content of total phosphorus within th
range of 50 to 200 mg/cu m. A decrease
phosphorus below 45 mg/cu m promises a rapid in
provement of the lake quality. The nutrient e
richment of the lake is largely due to the land r
noff and storm drainage, rather than the dischar
of sewage. A mathematical model of t
photosynthetic system was based on the relati
between the intensity of illumination and t
biomass of algae. The report includes a detail
record to taxa and densities of algae during d
ferent months of 1968 and 1969. (Wilde-Wisco
sin)
W71-08670

LOSSES OF MINERAL NUTRIENTS DURIN DECOMPOSITION OF TYPHA LATIFOLIA,
Savannah River Ecology Lab., Aiken, S.C.
Claude E. Boyd.
Archiv fur Hydrobiologie, Vol 66, No 4, p 511-5
1970. 4 fig, 1 tab, 11 ref.

Descriptors: *Aquatic plants, *Nutrients, *So
bility, Plant physiology, Degradation (Decomp
tion), Leaching, Eutrophication, Analysis, So
Carolina.
Identifiers: Typha latifolia, Par Pond (SC), Sav
nah River (SC).

Samples of Typha latifolia were placed into t
bags of fiberglass netting, and either suspende
cm above the water, or anchored on the surfac
the mud at a depth of 30 cm. The tissues in
merged bags showed a more rapid loss of dry
ganic matter than the suspended tissues; the de
mination of nitrogen, phosphorus, calcium,
nesium, potassium and sodium in plant tissue
dicated a more rapid return of nutrients to the
vironment from the submerged plants, acc
plished by microbial mineralization as wel
leaching; the latter was particularly conspicuo
the loss of monovalent bases. Aquatic macrop
decompose more rapidly than terrestrial plants
ing initial decay stages. (Wilde-Wisconsin)
W71-08673

TOXIC EFFECTS OF HEPTACHLOR,
Research Inst. of Hygiene, Bratislava
zechoslovakia).
L. Rosival, M. Vargova, and J. Uhnak.
International Chemical Engineering, Vol 10,
p 545-553, 1970. 8 fig, 4 tab, 16 ref.

Descriptors: *Pesticide toxicity, *Hepta
*Pesticides, Soils, Agriculture, Water pol
sources, Path of pollutants, Chlorinated hyd
bon pesticides, Public health, Persistence, En
mental effects, Pesticide kinetics, Laboratory
Identifiers: Biological pathways, Heptaclor
ide, Histopathological changes.

To estimate the risks of heptachlor resid
human foood, small animals were admin
residues of heptachlor in farm products gr
soil impregnated with this insecticide. I
treated with 5 kg/ha, gas chromatograph
electron capture detection revealed on the a
0.05 ppm, and in beets 0.37 ppm of hept
The acute toxic effect of heptachlor in m
rates is given. Acute intoxication of rats
companied by histopathological and electro
cal changes in the liver and kidneys. A
weeks, experiments confirmed cumulation
tachlor epoxide in the liver of rabbits (more
times the concentration in the feed) and es
in fat (more than 10 times the concentratio
feed) after feeding beets grown on soil impr
with helptachlor. After feeding corn grown
soil and containing less than 0.01 ppm
tachlor, no cumulation was found in the li
fat of ducks. Cumulation of heptachlor ep
fat requires a certain threshold conce
(0.01-0.05 ppm) of heptachlor in the feed.
Wisconsin)
W71-08675

BSERVATIONS ON THE SMALL-SCALE DIS-RIBUTION OF ESTUARINE PHYTOPLANK-ON,
aine Univ., Walpole. Ira C. Darling Center for esearch; and Maine Univ., Walpole. Dept. of ology.
J. McAlice.
arine Biology, Vol 7, No 2, p 100-111, 1970. 4 , 12 tab, 30 ref.

escriptors: *Phytoplankton, *Estuaries, *Dis-bution, Spatial distribution, Distribution pat-ns, Rhode Island, Maine, Population, Density, tistical methods.
ntifiers: *Phytoplankton patches, Asterionella onica, Chaetoceros laciniosus, Skeletonema statum, Ditylum brightwelli, Rhizolinia delicatu-Rhizosolenia setigera, Rhizosolenia fragilissima, alassiosira nordenskioldii, Thalassiosira cipiens, Thalassiosira gravida, Leptocylindrus nicus, Nitzschia seriata, Guinardia flaccida, iatella unipunctata, Prorecentrum triangulatum, ridinium triquetrum, Peridinium trochoideum, sthodiscus luteus, Narrangansett Bay (RI), mariscotta River (Me), Thalassionema zschioides.

pulation densities of phytoplankton were studied collections of eight series comprising 94 in-idual collections. Density differences were nonstrated by analyses of variance in the series en the collecting interval was more than 10 cm. tistically significant differences in the popula-n densities of individual species were found in st collection series. The data also suggest that ious species are affected differently by the nts responsible for small-scale variability. In-idual species in any series are generally over-persed. In Series IV total cell counts and colony nts of the three most abundant species were lyzed. Phytoplankton patches ranging in size m 1 to 21 m were tentatively identified. No cor-tion was found between temperature or salinity the small-scale distribution of individual spe-s. Counts taken on the ebb tide showed popula-n densities were substantially higher than those en in the flood tide. Throughout the 3 or 4 week om, Asterionella japonica was consistently more ndant in the upstream portion of the estuary occurred there in markedly longer chains. he indications of patch sizes in the various izontal series can be obtained from Tukey's tiple comparisons test. (Jones-Wisconsin)
1-08677

TABOLICALLY ACTIVE SPHEROPLASTS BLUE-GREEN ALGAE (IN RUSSIAN),
scow State Univ (USSR). Dept. of Microbiolo-
V. Gusev, K. A. Nikitina, and T. G. zhenevskaya.
lish summary. Mikrobiologiya, Vol 39, No 5, p -868, 1970. 5 fig, 2 tab, 15 ref.

criptors: *Algae, *Metabolism, *Cytological ies, Photosynthesis, Respiration.
ntifiers: *Lysozyme, *Spheroplasts, Blue-green e, Anabaena variabilis, Anacystis nidulans.

use of lysozyme permitted a quantitative aration of spheroplasts from the cells of blue-n algae Anabaena variabilis and Anacystis ulans. The yield of spheroplasts was correlated the concentration of lysozyme, the volume of tion mixture, conditions of mixing, and the od of incubation. The tolerance of cells to zyme was dependent on the species and the vth phase of algae. Spheroplasts of A variabilis bited endogenous respiration at the rate similar hat of the intact cells. A decrease in the content phycocyanin immobilized the ability of eroplasts to emit oxygen in light, thus confirm-the critical role of phycocyanin in photochemi-reactions. (Wilde-Wisconsin)
1-08683

CONTINUOUS SYSTEM MODELS OF OXYGEN DEPLETION IN A EUTROPHIC RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Chemistry.
For primary bibliographic entry see Field 06A.
W71-08684

INTERACTIONS BETWEEN DDT AND RIVER FUNGI. I. EFFECTS OF p,p'-DDT ON THE GROWTH OF AQUATIC HYPHOMYCETES,
Salford Univ. (England). Dept. of Biology.
S. A. Dalton, Madeline Hodkinson, and K. A. Smith.
Applied Microbiology, Vol 20, No 5, p 662-666, 1970. 3 fig, 43 ref.

Descriptors: *DDT, *Fungi, *Rivers, *Growth rate, *Aquatic plants, Nutrients, Permeability, Metabolism, Ecology, Cycling nutrients, Insecticides, Aquatic animals, Microorganisms, Pesticides.
Identifiers: *Hyphomycetes, *Growth enhancement, Heliscus submersus, Tetracladium setigerum, Varicosporium elodeae, Clavariopsis aquatica.

Effects of concentrations of 0.1 and 60 mg/ml DDT on the Hyphomycetes, Heliscus submersus, Tetracladium setigerum, Varicosporium elodeae, and Clavariopsis aquatica, four aquatic fungi, are studied. Concern for the potential long-term hazards of environmental contamination warranted investigation of the interactions between the insecticide and the aquatic microorganisms. DDT concentration below 2 mg/ml did not affect the growth of the fungi, at higher insecticide concentrations their growth rates were enhanced, increasing with increased concentration; the presence of the insecticide did not alter form of growth curves. In natural waters DDT concentrations rarely exceed 2 mg/ml. These fungi may be insensitive to environmental insecticide exposure; H submersus appears a more sensitive organism. The increased mycelial yields enhanced by the DDT might have resulted from DDT being used as a nutrient, DDT affecting the permeability of the fungal cells to other nutrients, or DDT increasing the metabolic rate of the fungi in the capacity of a cofactor. There may be ecological significance in this DDT enhancement of growth rate since these fungi decompose organic debris and cause the recycling of nutrients in the freshwater environment. (Jones-Wisconsin)
W71-08686

STIMULATORY PROPERTIES OF FILTRATE FROM THE GREEN ALGA HORMOTILA BLENNISTA. I. DESCRIPTION,
Providence Coll., R.I. Dept. of Biology; and Connecticut Univ., Storrs. Biological Sciences.
Thomas J. Monahan, and Francis R. Trainor.
Journal of Phycology, Vol 6, No 3, p 263-269, 1970. 3 fig, 4 tab, 37 ref. OWRR Project A-014-CONN (3).

Descriptors: *Algae, *Growth rates, *Productivity, *Plant growth substances, Photosynthesis, Metabolism, Bacteria, Hydrogen ion concentration, Laboratory tests.
Identifiers: *Green algae, *Hormotila blennista, Filtrates, Growth autostimulation, Growth regulation, Extracellular products, Algal excretions.

Autostimulation of growth by filtrates of Hormotila blennista is attributed to secretion of organic metabolites. The maximum stimulation in excess of 100% was exerted by filtrates obtained from 1 to 4 week old actively growing cultures. The filtrates supported bacterial growth and stimulated the growth of Scenedesmus at pH 6.3, but not at pH 7.7. Stimulatory properties of filtrates were terminated by autoclave treatment. A suggestion is made that extracellular secretions of H blennista influence the survival of the alga and the growth of other organisms. (Wilde-Wisconsin)
W71-08687

FOOD OF LOGPERCH (PERCINA CAPRODES), AND BROOK SILVERSIDE (LABIDESTHES SICCULUS), IN A NEW AND OLD OZARK RESERVOIR,
Bureau of Sport Fisheries and Wildlife, Fayetteville, Ark.
James W. Mullan, Richard L. Applegate, and William C. Rainwater.
Transactions of the American Fisheries Society, Vol 97, No 3, p 300-305, 1968. 2 fig, 3 tab, 12 ref.

Descriptors: *Fish, *Food habits, *Reservoirs, Silversides, Perches, Plankton, Aquatic insects, Crustaceans, Arkansas, Missouri.
Identifiers: *Bull Shoals Reservoir (Ark-Mo), *Beaver Reservoir (Ark-Mo), White River (Ozarks), Percina caprodes, Labidesthes sicculus, Euplankton, Tendipeds, Terrestrial spiders.

A comparison was made of food habits of the logperch, Percina caprodes, and the brook silverside, Labidesthes sicculus, inhabiting a 14-yr-old impoundment and a reservoir in the process of filling. The logperch in the new basin preferred aquatic insects to an exclusion of microcrustaceans; the silverside in the same reservoir ingested both foods and terrestrial spiders, but disdained the planktonic Chaoborus. In the older reservoir the logperch sustained on a mixed diet of benthic crustaceans and aquatic insects, whereas the silverside was largely dependent on insects. (See also W70-04190 and W70-05421) (Wilde-Wisconsin)
W71-08688

ECOLOGY OF YEASTS IN POLLUTED WATER,
Illinois Inst. of Tech., Chicago. Dept. of Biology.
Lynn L. Wollett, and L. R. Hedrick.
Antonie van Leeuwenhoek, Vol 36, No 3, p 427-435, 1970. 1 fig, 3 tab, 42 ref.

Descriptors: *Yeasts, *Water pollution, *Distribution patterns, Environmental effects, Water pollution effects, Industrial wastes, Domestic wastes, Oligotrophy, Fermentation, Sampling.
Identifiers: Rhodotorula, Cryptococcus, Candida, Mycelium.

The density and composition of extant yeasts were determined in 3 freshwater habitats exhibiting low pollution level (A), heavy industrial waste pollution (B), and heavy domestic waste pollution (C). The habitat A was dominated by Rhodotorula and Cryptococcus isolates, whereas the station B - by Rhodotorula and Candida; the majority of isolates at location C were Candida with Rhodotorula being second in abundance. All waters had large yeast population, averaging about 3,000 yeasts per 100 ml, but attaining at times density as high as 27,000/100 ml. The high proportion of Candida was correlated with the presence of human wastes. (Wilde-Wisconsin)
W71-08690

CHEMICAL ANALYSES OF SOME VASCULAR AQUATIC PLANTS,
Savannah River Ecology Lab., Aiken, S.C.
Claude E. Boyd.
Archiv fur Hydrobiologie, Vol 67, No 1, p 78-85, 1970. 4 tab, 22 ref.

Descriptors: *Aquatic plants, *Chemical analysis, *Pigments, Chlorophyll, Nutrients, Plant morphology, Phenology, Inorganic compounds, Eutrophication.
Identifiers: Par Pond (SC), Savannah River (SC).

Lush green specimens of some vascular aquatic plants were collected from a relatively homogenous sector of the impoundment (Par Pond, South Carolina) and analyzed for total alkalinity, ammonia, nitrates, phosphorus, sulfur, calcium, magnesium, potassium, sodium, iron, manganese, copper, zinc, chlorophyll-a and b, and carotenoids. The results indicated the range of inter-specific variation in chemical composition of plants, but provided no basis for a prediction of the levels of

chemical constituents in a particular aquatic community. (WildenWisconsin)
W71-08691

FIRST EXPERIMENTS OF MUSSELS PURIFICATION WITH ELECTROPHORESIS,
Messina Univ. (Italy). Inst. of Hygiene.
G. S. Gabbrielli, and E. La Pergola.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Fondation de la Ville de Nice, Nice, Vols 28 and 29, p 261-270, 1970. 8 ref.

Descriptors: *Shellfish, *Mussels, *Electrophoresis, Coliforms, E. coli, Water pollution effects, Water purification, Bacteria, Water pollution.
Identifiers: *Purification.

Experiments to verify the capabilities of electrophoresis for the purification of mussels and other edible shellfish were conducted. Samples of mussels contaminated with E. coli transferred to the electrophoretic tank and exposed to a voltage of six and twelve volts for ten, twenty, thirty and forty minutes showed a decrease but not a complete removal of bacteria. Six and twelve volts for forty minutes removed 90-95% of the coliform from mussels with low contamination. (Ensign-PAI)
W71-08721

COASTAL WATERS POLLUTION AND MOLLUSKS CULTURE, PROPOSAL FOR PRODUCTION, COMMERCE AND PURIFICATION OF MOLLUSKS,
Ufficiale Sanitario e Medico Provinciale di Toranto, Italy.
A. Leccese, and N. Clerico.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Fondation de le Ville de Nice, Nice, Vols 18 and 19, 1970, p 253-260.

Descriptors: *Coasts, *Aquiculture, *Mollusks, Pollutants, *Industrial wastes, *Municipal wastes, Legislation, *Ultraviolet radiation, Water reuse, Water pollution effects.

With the increase in coastal water pollution by urban and industrial wastes it is more and more difficult to find near-shore water appropriate for the culture of mollusks. Proposals for the production, commerce and legislation of mollusk culture are suggested. Several reclamation methods are in use, however, the method found to be most effective is one which makes use of sea water previously treated with ultraviolet rays which were found not to alter the organolectical characteristics of crustaceans, mollusks and plankton. (Ensign-PAI)
W71-08722

THE PRESENT STATUS OF DISEASES CONNECTED WITH MARINE POLLUTION,
Public Health Labs., Exeter (England).
B. Moore.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Foundation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 193-223. 28 ref.

Descriptors: *Water pollution effects, *Diseases, Environmental sanitation, *Infection, *Public health, Bacteria, Microorganisms, Coasts.
Identifiers: England.

Studies on sewage contamination of coastal waters were conducted by a group of British public health bacterioligists. The most effective methods of control are assessed as to whether control of the environment is necessary, or immunization with appropriate vaccines. A disesase may be proved to be caused by pollution before the organism has been isolated in the laboratory. Also the isolation of a pathogenic agent from the environment does not prove that the environment is a danger to health. Monitoring procedures to determine the diseases present in a specific community and the assessment of whether the environment monitored is dangerous in its own right, are considered. Relevant diseases to consider are those in which transmission is usually by the faecal-oral route, particularly water-borne diseases. Diarrhoeal diseases, poliomyelitis and infectious hepatitis are discussed in detail. Shellfish pollution is briefly mentioned. (Ensign-PAI)
W71-08726

PRESENCE OF POLYNUCLEAR AROMATIC HYDROCARBONS IN COASTAL WATERS AND THE POSSIBLE HEALTH CONSEQUENCES,
World Health Organization, Copenhagen (Denmark). Regional Office for Europe.
Michael J. Suess.
Revu Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la sante et de la Recherche Medicale, Foundation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 181-190. 46 ref.

Descriptors: Pollutants, *Industrial wastes, *Municipal wastes, Fish, *Food chains, *Public health, Coasts, Estuaries, Water pollution effects, *Aromatic compounds, Plants.
Identifiers: Polynuclear aeromatic hydrocarbons, Endogenic synthesis, Carcinogens.

Carcinogenic polynuclear aromatic hydrocarbons are distributed widely throughout the world, being found in coastal waters near heavily populated areas as well as in remote unpopulated zones. Endogenic synthesis of flora appears to a major contributor, however, PAH concentrations in coastal waters and estuaries may be increased by industrial and municipal effluents and atmospheric precipitation. Though no definite evidence exists that waste effluents polluting our seafood, have become an actual environmental cancer hazard to the general population it is still wise to remain concerned to forestall problems in the future. (Ensign-PAI)
W71-08727

AQUACULTURAL DEVELOPMENT AND PUBLIC HEALTH,
Food and Agriculutre Organization of the United Nations, Rome (Italy). Inland Fishery Resources Branch.
H. R. Rabanal.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de le Sante et de la Recherche Medicale, Fondation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 155-167. 40 ref.

Descriptors: *Aquiculture, *Proteins, *Food chains, *Human population, *Public health, Pollutants, Sewage, Fertilizers, Pesticides, Industrial wastes, Radioactive wastes, Water pollution effects.

Large scale development of aquaculture to meet the current and future shortage of high quality animal protein for the increasing world population is discussed. Several institutions and agencies in different parts of the world are actively engaged in investigations to establish aquaculture. In a number of countries, particularly in Asia and the Far East, the culture of sih and shellfish in brackish waters is rapidly expanding. There are certain public health problems associated with acquacultural development. Environmental changes brought about by impoundment of estuarine and coastal areas may result in increased hazards of water-borne diseases. Sewage effluents and animal manures as fertilizers for aquaculture, the uptake and accumulation of pesticide residues, industrial by-products, radioactive wastes and other pollutants and the danger of eating contaminated fish or shellfish grown in polluted water are all dangers to be considered. To deal effectively with the public health aspects of aquaculture close collaboration between medical scientists, aquaculture specialists and international agencies such as FAO and WHO is necessary (Ensign-PAI)
W71-08728

STUDY OF THE FILTER ACTIVITY OF CERTAIN MARINE ANIMALS (SALPA, CIONA, AMPHIOXUS) WITH RESPECT TO LABELLED BACTERIA, COMPARED TO THE ACTIVITY OF CERTAIN EDIBLE MOLLUSKS, (ETUDE DE L'ACTIVITE FILTRANTE DE CERTAINS ANIMAUX MARINS (SALPA, CIONA, AMPHIOXUS) A L'EGARD DE BACTERIES MARQUEES, COMPAREE A L'ACTIVITE DE CERTAINS MOLLUSQUES COMESTIBLES (MYTILUS, TELLINA)),
Naples Univ. (Italy). Instituto di Igiena.
M. R. Mazzara, R. Guidone, M. A. Mazzara, and H. F. Roecker.
Revue International d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie e d'Oceanographie Medical, Institut National de l Sante et de la Recherche Medicale, Fondation de l Ville de Nice, Nice, Vols 18 and 19, 1970, p 131-143.

Descriptors: *Self-purification, *Bacteria, *Water purification, Water pollution control, Sea water, Water pollution effects.
Identifiers: *Filtering organisms, Ciona, Amphioxus, Salpa, Salmonella.

The filtering mechanism of some 'filter feeders' ciona, amphixus, and Salpa were studied for their purifying action. Test-bacteria used were Salmonella (Ratin strain) labelled with p32 and paratuberculous bacilus (Pasteur No 607). Macroscopic demonstration of this activity was accomplished by dying bacteria with Rhodamin B and was strengthened by normal and fluorescent microscopy after dying with Ziel-Nielsen and Auramin. The determination of radioactivity of filtering organisms, using a geiger counter and bacteria labelled p32, permitted a qualitative or quantitative evaluation of the phenomena of predation. (Ensign-PAI)
W71-08730

ANTIBIOSIS PHENOMENA OF PHYTOPLANKTONIC ORIGIN IN THE MARINE ENVIRONMENT, ANTIBACTERIAL SUBSTANCE PRODUCED BY A DIATON ASTERIOMELLA JAPONICA, (PHENOMENES D'ANTIBIOSE D'ORIGINE PHYTOPLANCTONIQUE E MILIEU MARIN, SUBSTANCES ANTIBACTERIENNES PRODUITES PAR UNE DIATOMEE ASTERIONELLA JAPONICA),
Centre d'Etudes et de Recherches de Biologie d'Oceanographie Medicale, Nice (France).
M. Aubert, D. Pesando, and M. Gauthier.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie d'Oceanographie Medicale, Institut National de Sante et de la Recherche Medicale, Fondation de Ville de Nice, Nice, Vols 18 and 19, 1970, p 69-7 14 ref.

Descriptors: *Self purification, *Bacteria, *Phytoplankton, *Marine bacteria, *Soil bacteria, Chromatography, Water pollution effects.
Identifiers: Mediterranean phytoplankton, Antibacteria substances.

In situ investigations of several Mediterranean phytoplanktonic species producing antibacterial substances were observed. More than 25% showed antagonistic activity against terrestial bacterial flora. Asterionella japonica synthesized a fatty acid and a nucleoside. These substances were isolated from cell extracts by gel chromatography and studied in detail by physical and chemical processes. Results suggested that these biosecretions play an important role in marine equilibrium. (Ensign-PA
W71-08737

RTHER CONTRIBUTIONS TO THE STUDY THE BIOPRODUCTIVITY IN POLLUTED ARINE ECOSYSTEMS,
diterranean Marine Sorting Center, Salammbo nisia).
e Stirn.
vue Internationale d'Oceanographie Medicale, ntre d'Etudes et de Recherches de Biologie et ceanographie Medicale, Institut National de la te et de la Recherche Medicale, Fondation de la e de Nice, Nice, Vols 18 and 19, 1970, p 21-27. ref.

criptors: *Sewage bacteria, *Bacteria, *Oric wastes, *Primary producitivity, Phytoplank-, Water quality, Ecology, Water pollution efs.
ntifiers: *Nannochloris oculata.

n toxic organic sewage introduced into a marine er mass changes the chemical composition and ecological condition of the mass. A higher den- of primary productivity and a predominance of ain phytoplanktonic species are observed. nparisons of very polluted areas of water with s only slightly polluted showed a very high rate Nannochloris oculata in the highly polluted s. Studies of cultures of Nannochloris oculata ifferent medias show a definite elevation in the ence of organic sewage. (Ensign-PAI)
1-08739

ERMAL POWER, AQUATIC LIFE, AND OWATTS ON THE PACIFIC COAST,
ific Gas and Electric Co., Emeryville, Calif. Enering Research Dept.
es R. Adams.
lear News, Vol 12, No 9, p 75-79, Sept 1969. 5 l tab, 10 ref.

criptors: *Thermal power, *Cooling water, ssolved oxygen, Discharge measurements, er temperature, Aquatic life, California, Water ution effects.

ause of the differing physical processes in- ed, the evaluation of factors effecting aquatic from cooling water discharged from thermal tric power plants should be studied primarily at site rather than in a laboratory. The physical, mical and biological effects of heated water harges were measured at 15 California stations. n 17 papers and 68 mimeographed reports, e representative studies in three catagories n stations in both estuarine and open ocean enments are summarized: (1) thermal tolerance ies, (2) dissolved oxygen measurements and natural temperature changes. Studies on the mal tolerance of fish include assessment of the cts not only of the temperature changes, but of size of the area influenced by the discharge and time which an organism is subjected to particu- temperature elevations. Contrary to some ratory evidence, field evidence reviewed onstrated that the temperature increase does cause a change in the dissolved oxygen content ne water. Daily recordings of natural tempera- flucuations, which often exceed 20 deg F in e bays and at various depths in the open ocean, v that marine animals and plants are exposed to tantial natural fluctuations. (Hollister-PAI)
1-08740

IE ASPECTS OF MARINE PHYTOPLANKN STUDIES NEAR THE COLUMBIA RIVER, TH SPECIAL REFERENCE TO A SUBSURE CHLOROPHYLL MAXIMUM,
hington Univ., Seattle. Dept. of Oceanography.
rge C. Anderson.
ilable from the National Technical Information ice as RLO 1725-168, $3.00 in paper copy, 5 in microfiche.

criptors: *Phytoplankton, *Hydrography, trients, *Primary productivity, *Chlorophyll, ers, Water pollution effects, Oregon, Washing- *Columbia River.
tifiers: Species distribution, Size fractionation.

Studies begun in 1961 of the phytoplankton and primary production processes off the Washington and Oregon Coasts and the effects of the Columbia River on these waters are presented. Seasonal and areal distributions of phytoplankton concentrations and primary production rates are given along with relationships of these distributions to the areas hydrography. Also mentioned are size fractionation of phytoplankton populations in different seasons and locations, populations adaptation to light, phytoplankton excretion of dissolved organic matter, and the seasonal and vertical distribution of particulate matter. Mechanisms regulating the supply of nutrients to surface waters and to processes which form chlorophyll concentrations at various depths and the importance of these chlorophyll layers to production processes in the effluent area of the Columbia River outfall are emphasized. (Ensign-PAI)
W71-08741

RELEASE OF DISSOLVED ORGANIC MATTER BY MARINE PHYTOPLANKTON IN COASTAL AND OFFSHORE AREAS OF THE NORTHEAST PACIFIC OCEAN,
Washington Univ , Seattle. Dept. of Oceanography.
G. C. Anderson, and R. P. Zeutschel.
Available from the National Technical Information Service as RLO 1725-167, $3.00 in paper, $0.95 in microfiche.

Descriptors: *Phytoplankton, *Organic matter, *Photosynthesis, *Coasts, *Pacific Ocean, Water pollution effects, Eutrophication, Oligotrophy.
Identifiers: *Particulate organic matter, *Dissolved organic matter, *Liquid Scintillation counting.

The rate of release of dissolved organic matter from phytoplankton photosynthesis in offshore and coastal areas of the northeast pacific ocean was measured. A scintillation solution with high counting efficiency was used which allows sampling to be done easily and accurately at sea. Surface and eutrophic waters showed greatest absolute amounts of dissolved organic matter release, however, relative to total production, release was greatest in oligotrophic waters. Production of particulate organic matter and dissolved organic matter release were closely correlated. (Ensign-PAI)
W71-08742

BENTHIC INFAUNA COMMUNITIES OFF THE COAST OF WASHINGTON AND IN PUGET SOUND: SPECIES COMPOSITION AND STRUCTURE OF THE OFFSHORE COMMUNITIES,
Washington Univ., Seattle. Dept. of Oceanography.
Ulf Lie, and Dale S. Kisker.
Available from the National Technical Information Service as RLO 1725-174, $3.00 in paper copy, $0.95 in microfiche. July 10, 1970. 22 p.

Descriptors: *Benthos, *Coasts, *Animals, Water pollution effects, Washington, Amphipoda.
Identifiers: *Infauna, *Puget Sound, *Species composition, *Community structure, Polychaetes, Lamellibranchs, Echinoderms.

The species composition and the structure of three benthic communities were studied off the coast of Washington during 1967 and 1968. The deepwater community was in depths of 154. 5m and mean mud-percentage was 50.09%. In the intermediate depth sand-bottom community was found at depths of 95.8m with mean mud-percentage 30.86%. The shallow water community was at depths of 36.0m with a mean sand percentage of 96.33%. The most abundant species and the mean standing crop for each of the depths was determined. The variability in community diversity is discussed. Lower diversity was found in the shallow water sand-bottom community than in the deeper communities. (Ensign-PAI)
W71-08744

THE EXPERIMENTAL ANALYSIS OF BEHAVIOR IN SYMBIOSES,
California Univ., Santa Barbara. Dept. of Zoology.
Demorest D. Davenport.
Available from the National Technical Information Service as AD-716 633, $3.00 in paper copy, $0.95 in microfiche. Final Technical Report to Office of Naval Research Contract NONR 4222 (03). 53 p, 10 fig, 4 tab, 60 ref. Office of Naval Research Project No NR-104-275.

Descriptors: *Symbiosis, *Animal behavior, *Ecosystems, *Aquatic environment, Social aspects, Water pollution effects.
Identifiers: Chemoreception, Mechanoreception.

The communication machinery which brings together intimately associated marine species (symbioses) is analyzed. Many types of stimuli are involved and their function is considered in relation to the ecology of the specific organisms and the environment where they are found. The capacity and competency of visual and chemical signals in the sea are emphasized. (Ensign-PAI)
W71-08748

THE POLLUTION OF THE COASTAL OCEAN AND THE GREAT LAKES,
For primary bibliographic entry see Field 05B.
W71-08752

ECOLOGICAL EFFECTS OF POWER-PLANT COOLING,
Oak Ridge National Lab., Tenn. Ecological Sciences Div.
Charles C. Coutant.
Preprint Ecological Problems in the Marine Environment, 1st National Biological Congress, American Institute of Biological Sciences and Federation of American Societies for Experimental Biology, p 15-26, November 10, 1970, 3 fig, 1 tab.

Descriptors: *Environmental effects, *Ecology, *Powerplants, *Water pollution control, *Thermal pollution, Sites, Design, Monitoring, Control systems, Pollution abatement, Heated water.

Ecological problems associated with thermal pollution from power plants are discussed. These problems include a need for: 1) studies of biological changes caused; 2) multidisciplinary approaches; 3) standardization of site selection and surveying practices; 4) consistent temperature standards and regulations for maintaining water quality; and 5) an education of public attitudes. A review of literature on the biological and ecological effects of temperature changes is given. A discussion of steps in power-plant site selection and discharge design is presented, including a table outlining the pertinent ecological effects to be considered. An effective monitoring program must: 1) show if design changes are needed in the thermal discharge system to protect aquatic life; and 2) contribute toward quantitative models of thermal effects applicable to designing new effluent systems. Mention is made of the over 363 federal, state and utility research programs on thermal pollution problems presently being conducted throughout the country. (McEntyre-PAI)
W71-08762

POSSIBLE EFFECTS OF A SEA-LEVEL CANAL ON THE MARINE ECOLOGY OF THE AMERICAN ISTHMIAN REGION,
Battele Memorial Inst., Columbus, Ohio. Columbus Labs.
W. E. Martin, J. A. Duke, S. G. Bloom, and J. T. McGinnis.
Preprint Ecological Problems in the Marine Environment, 1st National Biological Congress, American Institute of Biological Sciences and Federation of American Societies for Experimental Biology, p 3-14, November 10, 1970. 1 tab.

Descriptors: *Ecology, *Environmental effects, *Canals, *Oceans, *Mixing, Ecosystems, Aquatic habitats, Migration, Open channels.
Identifiers: *American Isthmian Region, *Proposed sea-level canal.

Scientists have questioned the possible long-term ecological consequences of reuniting the Pacific and Caribbean biota via a sea-level canal. This preliminary report of research undertaken by the Bioenvironmental and Radiological-Safety Feasibility Program presents a literature survey summary of the marine ecology and physical oceanography of the isthmian region, and explores the marine habitats and biotic communities on both sides of the Isthmus, the role of mathematical modeling in studies of possible mixing processes, and the predictions of physical, biological, faunistic and floristic consequences. Conclusions from the ecological information available suggest net water flow would be from Pacific to Atlantic, with passive migration of planktonic organisms occuring likewise from Pacific to Atlantic. No evidence was found for predicting serious economic effects on fisheries or for mass migrations with widespread competition and extinction. (McEntyre-PAI)
W71-08763

MONITORING ECOLOGICAL CHANGES IN THE MARINE ENVIRONMENT,
Clapp (William F.) Labs., Inc., Duxbury, Mass.
For primary bibliographic entry see Field 05A.
W71-08766

WATER POLLUTION FROM PHOSPHATE,
Alice Q. Howard.
EnFo, January 1971, 4 p, 1 tab.

Descriptors: *Phosphates, *Detergents, *Water pollution effects, *Water pollution control, *Biodegradation, Fishkill, Eutrophication, Algal blooms, Water quality.
Identifiers: Enzyme presoaks, Dishwater detergents, NTA.

An evaluation of water pollution by phosphates in household detergents is presented. The distinction is made between biodegradability, or the breakdown ability of the cleaning agent of detergents in waste water, and the phosphate problem. Phosphates are placed in detergents to act as water softeners to make the cleaning agent more effective. The cycle of pollution effects from phosphate-induced plant growth include excessive algae blooms, excessive oxygen use as the plants later die, and finally suffocation of animal life such as fishes. The USDI estimates that 50-70% of phosphorus in city sewage comes from detergents. Phosphate substitutes such as NTA require extensive research to be sure they do not cause problems of their own. Enzyme presoaks and automatic dishwater detergents have high phosphate levels. Suggestions for consumer action to reduce phosphate use are given, including a list of detergents and their phosphate per load content. (McEntyre-PAI)
W71-08768

PESTICIDES AND PLOYCHLORINATED BIPHENYLS IN ESTUARIES,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
Thomas W. Duke.
Preprint, Ecological Problems in the Marine Environment, 1st National Biological Congress, American Institute of Biological Sciences and Federation of American Societies for Experimental Biology, p 27-32, November 10, 1970.

Descriptors: *Pesticides, *Pesticide toxicity, *Estuarine environment, *Industrial wastes, *Environmental effects, Pesticide residues, Estuaries, DDT, Chlorinated biphenyls.
Identifiers: *Polychlorinated biphenyls.

A survey is presented on pesticides and polychlorinated biphenyls (PCBs) and their water pollution effects in estuaries. Sources of pesticides are agricultural area run-off, direct application for insect control, and municipal and industrial effluents, while sources of PCBs are industrial effluents. Various monitoring programs have located pesticide residues in fish and shellfish. Examples of effects of pesticides on ecosystems are given, such as regional declines of the speckled seatrout, the altering of capacity of phytoplankton to photosynthesize, mortality and abnormalities in crabs fed brine shrimp nauplii containing DDT, affects on embryonic development and larvae of filter-feeding mollusks, and death of sheepshead minnows. PCBs, including Aroclor 1260 and Aroclor 1254, have been located in bays and estuaries, in seals, porpoises, birds, fish, mussels, and shellfish. Bioassays conducted to determine effects of Aroclor 1254 on estuarine organisms show that the animals can concentrate the PCB, which can be toxic at concentrations in the ppb range. Realizing the potential hazard of PCBs, the Monsanto Chemical Company has recently announced that PCB sales would be limited to only those who could control disposal of the final product. A continual monitoring program of estuaries for toxic materials and effects is a necessity. (McEntyre-PAI)
W71-08772

NUTRIENT MANAGEMENT IN THE POTOMAC ESTUARY,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Support Lab.
Norbert A. Jaworski, Donald W. Lear, Jr., and Orterio Villa, Jr.
Technical Report 45, January 1971, 69 p, 21 fig, 3 tab.

Descriptors: *Estuaries, *Nutrients, Water quality control, *Ecology, *Algae, *Eutrophication, Nutrient requirements, Municipal wastes.
Identifiers: *Potomac River Estuary.

The water quality of the upper Potomac Estuary has been degraded as a result of municipal wastewater from the metropolitan area of Washington. Past studies indicated high coliform densities, low dissolved oxygen content, and large populations of blue-green algae as major water quality management problems of the upper and middle areas of the estuary. Studies and concepts used to formulate a nutrient management program for the Potomac Estuary are presented. Current water quality conditions and ecological trends are discussed. The sources, controllability, transport and criteria establishment of nutrients are discussed and suggestions for wastewater treatment requirements and a water quality management program are made. (Ensign-PAI)
W71-08775

BIOLOGICAL AND OCEANOGRAPHICAL SURVEY OF THE SANTA BARBARA CHANNEL OIL SPILL 1969-1970, VOLUME I: BIOLOGY AND BACTERIOLOGY; VOL II: PHYSICAL, CHEMICAL AND GEOLOGICAL STUDIES.
University of Southern California, Los Angeles. Allan Hancock Foundation.

Allan Hancock Foundation, University of Southern California, Sea Grant Publication No 2, 1971, Vol 1, 426 p, Vol. 2; 477 p.

Descriptors: Water pollution effects, Water pollution control, *Environmental effects, *Oil wastes, Oily water, Water pollution sources, Aquatic animals, Aquatic habitats, California, Sampling, Pollutant identification.
Identifiers: *Oil spills, *Santa Barbara (Calif).

On February 20, 1969, the Western Oil and Gas Association awarded a research grant to the Allan Hancock Foundation, University of Southern California, to study the biological and oceanographical effects of oil spillage in the Santa Barbara Channel following the 1969 blowout. The grant was for a twelve month field study so that indications of recovery, as well as damage, could be studied. The results summarized data available from government agencies, including the California State Water Quality Control Board, the California Department of Fish and Game, the Federal Water Quality Administration, and the United States Bureau of Commercial Fisheries. Unfortunately no all of the data were available due to restrictions im posed pending several legal suits. The results o these research papers in Volume I were compile by Dr. Dale Straughan and edited by Mrs. D. Hal mos. Papers in Volume II were compiled and edite by Dr. Ronald L. Kolpack. (See also W71-0877 thru W71-08801)
W71-08776

NATURAL OIL SEEPS: HISTORICA BACKGROUND,
University of Southern California, Los Angele Allan Hancock Foundation.
C. Ventura, and J. Wintz.
In: Biological and Oceanographical Survey of th Santa Barbara Channel Oil Spill, 1969-1970, Vo 1, Biology and Bacteriology, p 11-16, 1971, 16 ref

Descriptors: *Oil, *Seepage, History, *Oily wate Water pollution sources, Surface waters, Califo nia, Water pollution effects.
Identifiers: *Santa Barbara Channel.

Natural oil seeps in the Santa Barbara Chann were recorded prior to Spanish settlements in t 1780s. Indians used the material for waterproofi and mending canoes; Cabrillo mentions tarry su stances in Santa Barbara Bay and in 1543 seam passing the area record the smell of bitumen. N merous journals and shiplogs contain similar ports of submarine seeps. Recent photographs these seeps show three types of oil release: 1) sm beads concentrated over crusty white sediments; tar mounds from which teardrops of visco material with whiplike tails escape, and 3) globul released at two to three second intervals. Depe ing on the nature of the seepage, daily relea range from 11 to 160 barrels, with an average being 50 to 70 barrels. Plotted positions of kno offshore seeps include one near Platform A, site the 1969 Santa Barbara Channel oil spill. (See a W71-08776) (Moe-PAI)
W71-08777

PRIMARY PRODUCTIVITY IN THE SAN BARBARA CHANNEL,
University of Southern California, Los Ange Allan Hancock Foundation.
M. Oguri, and R. Kanter.
In: Biological and Oceanographical Survey of Santa Barbara Channel Oil Spill, 1969-1970, 1, Biology and Bacteriology, p 17-48, 1971. 18 2 tab, 9 ref.

Descriptors: *Phytoplankton, *Aquatic produc ty, *Environmental effects, *Oily water, Samp On-site data collections, Cruises, California, W pollution effects.
Identifiers: *Santa Barbara Channel.

Artificial alterations in the environment join n ral environment cycles to effect change phytoplankton production, thus effecting amount of energy available for most sea organi The Santa Barbara Channel oil blowout in Jan 1969 substantially increased the amount of o ready present from natural oil seeps. To deter the effects of increased quantities of oil, samp of normal phytoplankton productivity were m first at 11 stations in the eastern part of the S Barbara Basin, and then during five cruises o entire basin. Results are shown in tables graphs. The possibility of low productivity resu from the presence of surface oil did not appe be substantiated by the data. (See also 08776) (Moe-PAI)
W71-08778

OBSERVATIONS ON THE ZOOPLANKTO THE EASTERN SANTA BARBARA CHAN FROM MAY, 1969 TO MARCH, 1970,
University of Southern California, Los An Allan Hancock Foundation.
Diane Robbins McGinnis.

Biological and Oceanographical Survey of the
ta Barbara Channel Oil Spill, 1969-1970, Vol.
iology and Bacteriology, p 49-59, 1971. 2 tab, 3

criptors: *Zooplankton, Water pollution ef-
, Sampling, *Environmental effects, *Oily
r, *Aquatic productivity, *Distribution pat-
s, Sampling, Aquatic populations, California,
ution identification.
tifiers: *Santa Barbara Channel.

hods of collecting and studying samples of sur-
plankton taken over a ten-month period from
Santa Barbara Channel are discussed. Purpose
e study was to determine the influence of the
ary 1969 Santa Barbara oil spill on zooplank-
ecology. Comparative data, collected over
ral seasons, are required to establish normal
meters of zooplankton variability. Within the
s of the study discussed, it was observed that
lankton was present at all stations all year,
g most abundant in January 1970, least in Sep-
er 1969 and that penilia avirostris was
rded for the first time in Southern California
ic waters. Percentages of the number of
imens counted in each major taxonomic group
hown in accompanying tables. (See also W71-
6) (Moe-PAI)
-08779

BENTHIC FAUNA IN THE SANTA BAR-
A CHANNEL FOLLOWING THE JANUA-
1969, OIL SPILL,
ersity of Southern California, Los Angeles.
n Hancock Foundation.
ian Fauchald.
iological and Oceanographical Survey of the
a Barbara Channel Oil Spill, 1969-1970, Vol.
ology and Bacteriology, p 61-116. 8 fig, 5 tab,
f.

riptors: *Benthic fauna, *Aquatic productivi-
Plant populations, *Mortality, *Environmental
ts, Water pollution effects, *Oily water, Pollu-
dentification.
ifiers: *Santa Barbara Channel, *Listriolobus.

crease in the standing crop of benthic fauna
reported through surveys taken from 1956 to
; studies made after the January 1969 Santa
ara Channel oil spill show that the standing
of macro-invertebrates continues to decrease
atically. Several reasons could cause the
ease: abnormally high rainfall, increase in
ge due to increased human population, well
ng operations, and the oil spill. However, the
of data from 1960 to 1969 makes it impossible
inpoint the exact cause of the population
ction. A large-scale program is needed to
tor the benthos. Increased human activity in
area can only be deleterious, therefore a
nal program of exploitation is recommended.
diminishing Listriolobus beds on the Santa
ara shelf are unique to that area and must be
rved. (See also W71-08776) (Moe-PAI)
-08780

E POLYCHAETOUS ANNELIDS FROM
SANTA BARBARA SHELF AREA,
ersity of Southern California, Los Angeles.
n Hancock Foundation.
nond Emerson.
iological and Oceanographical Survey of the
a Barbara Channel Oil Spill, 1969-1970, Vol 1,
gy and Bacteriology, p 117-147, 1971. 4 tab,

riptors: *Annelids, *Benthic fauna, *Distribu-
patterns, *Aquatic habitats, *Oily water,
ling, Water pollution effects, California, Pol-
t identification.
ifiers: *Santa Barbara Channel.

ve of 32 polychaete families collected in
lings of the Santa Barbara shelf area, and
prising 70 percent of the total polychaete
sampling, were analyzed to species. Samplings were taken from depths ranging from 11 to 110m., with 32 percent at 40 to 50m. For 46 Species collected, a systematic analysis is given, listing diagnostic characteristics, distribution and habitat data. Tables of distribution of species in five types of sediment and by depth are given. Several new species were identified in the investigation, which was part of an extensive survey of fauna done after the January 1969 oil spill in Santa Barbara Channel. (See also W71-08776) (Moe-PAI)
W71-08781

NOTES ON SOME OPHIUROIDS FROM THE SHELF OFF SANTA BARBARA,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
Jack Wintz, and Kristian Fauchald.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 149-158, 1971. 1 fig, 3 tab, 6 ref.

Descriptors: *Benthic fauna, *Distribution patterns, *Aquatic habitats, Sampling, Water pollution effects, California, Pollutant identification.
Identifiers: *Santa Barbara channel, *Ophiuroids, *Amphiodia.

Physical and habitat characteristics of Amphiodia digitata and A. urtica are compared, as part of a study of ophiuroids collected in a benthic fauna survey taken after the January 1969 Santa Barbara oil spill. A. urtica is the dominant ophiuriod in the area sampled. Depth distribution findings indicated that the species may be more frequent in deep water rather than in intermediate depths, a contrast to earlier studies of the entire Southern California coast. Habitats for nine ophiuroids collected are briefly described. (See also W71-08776) (Moe-PAI)
W71-08782

A STUDY OF THREE SANDY BEACHES IN THE SANTA BARBARA, CALIFORNIA, AREA,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
Thomas Trask.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 159-177, 1971. 15 tab.

Descriptors: *Invertebrates, *Beaches, *Oily water, *Distribution patterns, *Density, *Crustaceans, Mollusks, Water pollution effects, California, Pollutant identification.
Identifiers: *Santa Barbara Channel.

An investigation of species density of invertebrate infauna on Santa Barbara's sandy beaches was made, to determine seasonal variation of the number and abundance of species. The sampling was begun six months after the Santa Barbara Channel oil blowout. As no similar studies were made at the area prior to the blowout, conclusions cannot be drawn about the effect of the spill. Samples were collected from July 1969 to April 1970, at Carpinteria State Beach, Coal Oil Point Beach and Ellwood Beach. They were taken along predetermined lines at low tide. Tables list the number of specimens collected of species of crustacea, polychaeta and mollusca, as well as of insect larvae and unidentified nemertea. (See also W71-08776) (Moe-PAI)
W71-08783

A STUDY OF THE BACTERIAL POPULATION OF BOTTOM SEDIMENTS IN THE SANTA BARBARA CHANNEL AFTER THE OIL SPILL,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
Sister Damien Marie Juge.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 179-222, 1971. 33 fig, 9 tab, 2 ref, 4 plates.

Descriptors: *Aerobic bacteria, *Bottom sediments, *Oily water, *Drainage water, *Density, Water pollution effects, California.
Identifiers: *Santa Barbara Channel.

Observations made of bacterial populations in waste fields after the Santa Barbara Channel oil slick conflict with prior studies. The Santa Barbara study was intended to observe the effect of increased levels of oil and its degradation products in the benthic and sedimentary bacterial population. Materials and methods of the research are described. Until the oil content of individual sediment samples is determined, conclusions can not be drawn; therefore, this paper is considered to be a preliminary report. Data are presented in tables and graphs, showing counts of aerobic bacteria per gram net weight at specific depths at nine sampling stations. (Moe-PAI)
W71-08784

BREEDING AND LARVAL SETTLEMENT OF CERTAIN INTERTIDAL INVERTEBRATES IN THE SANTA BARBARA CHANNEL FOLLOWING POLLUTION BY OIL,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
Dale Straughan.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 223-244, 1971. 1 fig, 4 tab, 14 ref, 1 plate.

Descriptors: *Oily water, *Intertidal areas, *Invertebrates, *Larvae, *Breeding, Water pollution effects, Mussels, Bloodworms, Crabs, California.
Identifiers: *Santa Barbara Channel, *Goleta Point.

To determine effects of oil on breeding and larval settlement of intertidal animals, studies were made of those exposed to sublethal doses of oil from natural seepage and on those which survived the January 1969 Santa Barbara oil spill. Species, chosen from a variety of habitat, represented barnacles, mussels, limpet, sand crab and bloodworm. Samples were collected from seep and non-seep areas in and near the Santa Barbara Channel from Goleta Point. They were examined for amount of oil on the animal, new settlement, and the number of adults breeding. Effects on reproduction depended upon the species. Findings are reported in the text and in tables. (See also W71-08776) (Moe-PAI)
W71-08785

OIL POLLUTION AND FISHERIES IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles.
Allan Hancock Foundation.
Dale Straughan.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 245-254. 4 fig, 2 tab, 1 ref.

Descriptors: *Oily waters, *Fish populations, *Fishing, *Fishkill, Water pollution effects, California.
Identifiers: *Santa Barbara Channel.

Despite reports of smaller yields of fish caught by commercial and party boat fishermen after the January 1969 Santa Barbara oil spill, post-spill surveys made by the California Department of Fish and Game indicate few variations from earlier surveys. Fish sampled appeared healthy and well fed; species diversity was reported maintained. Lower yields were attributed to a reduction of fishing boats entering the area, because fishermen either feared that fish would be contaminated or were unwilling to take extra time to clean oil from boats and gear. (See also W71-08776) (Moe-PAI)
W71-08786

WHALES, DOLPHINS AND OIL POLLUTION,
Johns Hopkins Univ., Baltimore, Md. Dept. of Pathobiology.

Robert L. Brownell, Jr.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 255-276, 1971. 3 tab, 20 ref.

Descriptors: Water pollution effects, *Mammals, *Animal behavior, *Migration, *Mortality, *Oily waters, Aquatic animals, California.
Identifiers: *Santa Barbara Channel, *Mass media, *Whales, *Dolphins.

Newspaper and journal reports cited oil contamination as the cause of death of several whales and dolphins stranded after the January 1969 Santa Barbara Channel spill. Brief accounts of these reports are presented, followed by discussion of the individual whale strandings and the probable cause of death. In highly publicized cases when newspapers linked whale death directly to the oil spill, autopsies and tissue analysis revealed no unusual presence of oil. Also the number of gray whale strandings in 1969 did not significantly differ from that of previous years. An account of gray whale feeding and migration habits is included. (See also W71-08776) (Moe-PAI)
W71-08787

OIL CONTAMINATION AND ELEPHANT SEAL MORTALITY: A 'NEGATIVE' FINDING,
California Univ., Santa Cruz. Crown Coll.
Burney J. Le Boeuf.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 277-285, 1971. 3 fig, 2 tab, 2 ref.

Descriptors: Water pollution effects, *Oily water, *Aquatic animals, *Migration, Tagging, *Mortality, California.
Identifiers: *Santa Barbara Channel, *San Miguel Island, *Seals, Elephant seals.

The crude oil that coated 100 weaned elephant seal pups a month after the Santa Barbara Channel spill apparently had no deleterious effect on the pups' health. Through the National Park Service, the animals were examined and specimens analyzed. No oil was found in tissue of two dead seals or in blood samples from the few sick ones. Because of the incompleteness of the Park Service report, more information was sought through a tagging survey, to see if the pups would be effected after they went to sea. In 15 months following tagging, 40% of the oil groups pups were sighted, compared to 25% in the control group. Except for one oil group animal, all animals were reported in apparent good health. Only one showed traces of oil. The data supported earlier conclusions while adding information on absence of long-term deleterious effects. (See also W71-08776) (Moe-PAI)
W71-08788

CALIFORNIA SEA LION MORTALITY: NATURAL OR ARTIFACT,
Johns Hopkins Univ., Baltimore, Md. Dept. of Pathobiology and; California Univ., Santa Cruz. Crown Coll.
Robert L. Brownell, Jr., and Burney J. Le Boeuf.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 287-306, 1971. 2 fig, 1 tab, 37 ref.

Descriptors: Water pollution effects, *Oily water, *Aquatic animals, *Pesticides, *Mortality, Reproduction, Mammals, California.
Identifiers: *Santa Barbara Channel, *San Miguel Island, California sea lion.

The small amount of information on mortality, abortion and premature birth rates of the California sea lion is reviewed. Included are data on the possible association of pesticides and oil pollution on sickness and mortality in pinnipeds. Although mass media reported that the several sea lion deaths on San Miguel Island were caused by oil from the January 1969 Santa Barbara Channel spill, investigators found the death rate to be within normal limits, and believe that oil contamination had only a small, if any, deleterious effect on the pups. Also given is a report on the effects of organochlorine pesticides, as DDT and DDE; effects vary greatly among different species of pinnipeds. Frequency data is needed for evaluating future calamites. (See also W71-08776) (Moe-PAI)
W71-08789

OIL POLLUTION AND SEA BIRDS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
Dale Straughan.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 307-312, 1971. 2 tab, 3 ref.

Descriptors: *Oily water, Water pollution effects, *Mortality, *Birds, *Water birds, California.
Identifiers: *Santa Barbara Channel.

An estimated loss of 3,600 birds in a two-month period can be attributed to the January 1969 Santa Barbara Channel oil spill. Loons and grebes had the highest death rates, with cormorants and pelicans second. The count was made on 75.5 miles of beach, from Point Conception to Ventura. Swimming species had the highest mortality rate. Oil causes fine elements of plumage to adhere together breaking down the capacity of feathers to insulate birds from cold water. Specific species mortality figures are given. (See also W71-08776) (Moe-PAI)
W71-08790

SANTA BARBARA'S OILED BIRDS,
California Univ., Santa Barbara.
Barbara Drinkwater, Maurine Leonard, and Susan Black.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 313-324, 1971. 2 fig.

Descriptors: *Water birds, Water pollution effects, *Oily water, *Rehabilitation, *Cleaning, Treatment, California.
Identifiers: *Santa Barbara Channel, Oil-drenched Birds Treatment Center.

Successes and failures in treating oil-drenched birds at a treatment and rehabilitation center which opened after the January 1969 Santa Barbara Channel spill are described. Volunteer workers, none of them ornithologists, began the long procedure by washing birds in warm water with a non-toxic dispersant. They developed several methods for internal treatment, sometimes successful, sometimes not. Problems were many, feeding, food size, diet, floor covering, warmth. Some were solved in inventive ways, as putting tobacco bag booties on feet and legs treated with a moisturizing ointment. Recommendations are given on volunteer training, handling methods and facilities. Because it is necessary to act quickly to save oil-drenched birds, methods of handling should be investigated and available. (See also W71-08776) (Moe-PAI)
W71-08791

THE SANTA BARBARA OIL SPILLS OF 1969: A POST-SPILL SURVEY OF THE ROCKY INTERTIDAL,
University of Southern California, Los Angeles. Allan Hancock Foundation.
Nancy L. Nicholson, and Robert L. Cimberg.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 325-399, 1971. 18 tab, 25 ref, 9 plates.

Descriptors: *Marine plants, *Oily water, Water pollution effects, *Intertidal areas, *Invertebrates, *Algae, California.
Identifiers: *Santa Barbara Channel.

Differences between the January 1969 Santa Barbara oil spill and earlier spills, as the 1957 Tampico Maru accident and the 1969 Torrey Canyon accident are compared. In the two ship incidents, massive kills of intertidal organisms were due to toxic components in diesel oil or dispersants. Spectular effects were not found at the Santa Barbara intertidal, even after a year study. Comparisons are made of marine plant populations from monthly samplings taken at ten rocky intertidal stations in and outside of the spill area. Selection of sampling sites, sampling methods used, and treatment of the data accompany detailed discussion of study findings. Many species are listed in extensive tables that chart the study findings. (See also W71-08776) (Moe-PAI)
W71-08792

WHAT HAS BEEN THE EFFECT OF THE SPILL ON THE ECOLOGY IN THE SANTA BARBARA CHANNEL,
University of Southern California, Los Angeles. Allan Hancock Foundation.
Dale Straughan.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 1, Biology and Bacteriology, p 401-426, 1971. 1 fig, 1 tab, 11 ref.

Descriptors: *Oil, Seepage, Water pollution effects, Environmental effects, *Benthic fauna, *Invertebrates, *Fish populations, *Mortality, *Algae, California.
Identifiers: *Santa Barbara Channel.

Because many questions lack answers, the effect of ecology of the 1969 Santa Barbara Channel oil sp may never be known. Environmental factors su as prior natural seepage, heavy rains, increase sedimentation and a possible increase in pesticide contribute to the problems of isolating oil spill effects. Evidence suggests increased productivity benthic fauna in inshore waters after the spill, d possibly to increased nutrients. Studies of san beach fauna showed no direct effects. Invertebrat whose shells were covered with oil appear healthy. Fish surveys indicate a stable fish popul tion and there is no proof that oil was direc responsible for marine mammal deaths. High m tality rates were recorded in pelagic bird popu tions, marine grass, barnacle species and in mar algae. Hypotheses are presented as to why the sp caused so little damage to the area's ecology, esp cially when compared to other spills. (See a W71-08776) (Moe-PAI)
W71-08793

PHYSICAL CHARACTERISTICS OF SAND BEACHES IN THE SANTA BARBARA CHANNEL AREA,
University of Southern California, Los Angel Dept. of Geological Sciences.
Ronald L. Kolpack.
In: Biological and Oceanographical Survey of Santa Barbara Channel Oil Spill, 1969-1970, Vo Physical, Chemical and Geological Studies, p 7- 1971. 35 fig, 1 tab, 3 ref.

Descriptors: *Beaches, *Sands, *Beach erosi *Water circulation, *Weather patterns, *Distri tion patterns, *Oil, Water pollution effects, Cali nia.
Identifiers: Santa Barbara coast.

Observations of the movement of beach sand determine if oil deposited on beaches altered n mal seasonal changes were part of a study m after the January 1969 Santa Barbara Chan spill. Profile measurements using a closely spa grid were taken of changes at ten mainland beac for one year. Records were kept of sediment water samples, wave period and height, orienta of the shoreline and approaching waves, water air temperature, cloud cover, wind speed direction, and longshore drift velocity. Pho raphy was also used. Graphs of beach profiles other findings accompany the text. Through n ral cycles, beaches returned to normal within

r. Deposition of oil on the beaches did not sig-
icantly alter the normal movement of beach
d. (See also W71-08776) (Moe-PAI)
1-08794

ASONAL STUDY OF BEACH
RAMINIFERAL POPULATIONS IN THE
NTA BARBARA CHANNEL AREA,
iversity of Southern California, Los Angeles.
pt. of Geological Sciences.
ıald W. Morin.
Biological and Oceanographical survey of the
ta Barbara Channel Oil Spill, 1969-1970, Vol 2,
ysical, Chemical and Geological Studies, p 64-
1971. 13 fig, 12 ref.

scriptors: Water pollution effects, *Oily water,
ortality, *Zooplankton, Beaches, Aquatic popu-
ons, Distribution patterns, California.
ntifiers: *Santa Barbara Channel,
oraminifera.

er the January 1969 Santa Barbara Channel
l, an eleven-month study was made of the ef-
s of oil pollution on beach foraminiferal popu-
ons. Frequency distribution of species found on
eaches is discussed as well as graphed. The fau-
changes of foraminifera seem to be the result of
sonal variations. The possibility of a kill-off of
species by oil pollution is remote. (See also
1-08776) (Moe-PAI)
1-08795

EANOGRAPHY OF THE SANTA BARBARA
ANNEL,
versity of Southern California, Los Angeles.
pt. of Geological Sciences.
ert L. Kolpock.
Biological and Oceanographical survey of the
ta Barbara Channel Oil Spill, 1969-1970, Vol 2,
sical, Chemical and Geological Studies, p 90-
, 1971. 72 fig, 3 ref.

criptors: Surface waters, *Water temperature,
linity, *Circulation, *Currents, *Oceanog-
ıy, Coasts, California, Water pollution effects.
ntifiers: *Santa Barbara Channel.

many physical, chemical and geological studies
ertaken to access the effects of an oil spill in
ıa Barbara Channel required thorough
wledge of the oceanography of the area. By
bining original research with past studies,
er circulation and current patterns were derived
the area. Surface water temperature, salinity
nutrient values reflect the circulation pattern
cribed. Numerous graphs, charts and profiles
ompany this report, showing temperature and
ity values, surface water currents as derived
ı drift card surveys, surface water temperature
nutrients. (See also W71-08776) (Moe-PAI)
1-08796

ANSPORT AND DEPOSITION OF FLOOD
IMENT, SANTA BARBARA CHANNEL,
LIFORNIA,
versity of Southern California, Los Angeles.
t. of Geological Sciences.
id E. Drake, Peter Fleischer, and Ronald L.
ack.
Biological and Oceanographical Survey of the
a Barbara Channel Oil Spill, 1969-1970, Vol 2,
sical, Chemical and Geological Studies, p 181-
1971. 11 fig, 3 tabs, 14 ref.

criptors: *Sediments, *Sediment transport,
liment distribution, Runoff, Rivers, *Floods,
position, Water pollution effects, California.
tifiers: *Santa Barbara Channel.

oxidized red-brown river sediment carried into
Santa Barbara Channel during heavy rains and
rd run-off was easy to trace, as the sediment
rasted with the olive-gray sediment of the
nel. The Santa Clara and Ventura Rivers con-
ted more than 50 x 106 tons of suspended sediment. Initial deposition of about 40 x 106 tons occurred within 20 kilometers of the river mouths. Eighteen months later, more than 15 x 106 tons had accumulated at depths between 500 and 600m in the central portion of the basin. Information on the distribution of suspended particles within the water column was obtained with a continuously-recording beam transmissometer. Mineral composition of the sediment is shown in tables. (See also W71-08776) (Moe-PAI)
W71-08797

FORAMINIFERAL POPULATIONS IN THE SANTA BARBARA CHANNEL: OFFSHORE SPECIES,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
Ronald W. Morin.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 2, Physical, Chemical and Geological Studies, p 218-275, 1971. 37 fig, 16 ref.

Descriptors: Water pollution effects, *Plankton, Mortality, *Benthos, *Benthic fauna, Aquatic populations, *Distribution patterns, Sewage effluents, California.
Identifiers: *Santa Barbara Channel.

Offshore species of formainifera taken from bottom sediments of the Santa Barbara Channel after the January 1969 oil spill showed populations typical of normal conditions on the Southern California mainland shelf. Charts show the percentages and population sites of living Buliminella elegantissima and Nonionidae over a ten-month period. The former fourishing in sewer effluents of the channel, spread from its usual habitat, while Nonionidae, relatively intolerant of sewer outfall pollution, maintained its usual pattern. (See also W71-08776) (Moe-PAI)
W71-08798

HYDROCARBON CONTENT OF SANTA BARBARA CHANNEL SEDIMENTS,
University of Southern California, Los Angeles. Dept. of Geological Sciences; and Cincinnati Univ., Ohio. Dept. of Chemistry; and Gulf General Atomic Co., San Diego, Calif.
Ronald L. Kolpack, James S. Mattson, Harry B. Mark, Jr., and Ta-Ching Yu.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 2, Physical, Chemical and Geological Studies, p 276-295, 1971. 9 fig, 5 ref.

Descriptors: *Sediment distribution, *Analytical techniques, *Spectrometers, *Bottom sediments, *Oily water, *Deposition, Water pollution effects, Sediment-water interface, California.
Identifiers: *Santa Barbara Channel, *Hydrocarbons.

Because tar and oil had been observed in shelf and basin sediments collected from the Santa Barbara Channel, the area was selected for a study of hydrocarbon content of surficial marine sediments. The study, begun in late 1968, was intended to evaluate infrared analytical techniques and establish background levels of the hydrocarbon content. Analysis showed higher total hydrocarbon concentrations in areas of maximum oil slick coverage after the January 1969 spill. Subsequently, these hydrocarbons were deposited or redeposited at the sediment-water interface in another part of the channel, and eventually became aligned with the main avenues of sediment transport toward the central basin. Because of the results discussed and supplementary information, researchers believe that estimates of the amount of oil released by the oil blowout are too low. (See also W71-08776) (Moe-PAI)
W71-08799

GENERAL CHARACTERISTICS OF NEARSHORE SEDIMENTS FROM EL CAPITAN TO VENTURA, CALIFORNIA, 1969-1970.
University of Southern California, Los Angeles. Dept. of Geological Sciences.
D. S. Gorsline, B. M. Brenninkmeyer, W. C. Meyer, M. R. Ploessel, and G. I. Shiller.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 2, Physical, Chemical and Geological Studies, p 296-317, 1971. 6 fig, 11 ref.

Descriptors: *Bottom sediments, *Clays, *Particle size, *Sediment distribution, Oily water, *Sediment transport, Organic matter, Carbonates, California, Water pollution effects.
Identifiers: *Santa Barbara Channel.

The texture, coarse fraction components, carbonate content and organic carbon content of nearshore bottom sediments were studied from samples taken from Santa Barbara's mainland coast after the January 1969 oil spill. Descriptions and charts review findings, discussing sediment textures, clay, silt and sand distribution, organic content and carbonate content. General sediment trends support the tentative conclusions that the find load is from the Ventural and Santa Clara rivers and that the sand fraction is probably locally derived. Organic contents definitely show the influence of the oil seeps in the Coal Oil Point area; the sand fraction in all samples contained tar bits and plant debris. (See also W71-08776) (Moe-PAI)
W71-08800

FORAMINIFERAL POPULATIONS IN THE SANTA BARBARA REGION: NEARSHORE SPECIES,
University of Southern California, Los Angeles. Dept. of Geological Sciences.
Ronald W. Morin.
In: Biological and Oceanographical Survey of the Santa Barbara Channel Oil Spill, 1969-1970, Vol 2, Physical, Chemical and Geological Studies, p 318-340, 1971. 12 fig, 10 ref.

Descriptors: Water pollution effects, *Oily water, Aquatic populations, *Benthos, *Benthic fauna, *Plankton, Sewage effluents, California.
Identifiers: *Santa Barbara Channel, *Foraminifera.

After the January 1969 Santa Barbara Channel oil spill, the size of benthonic foraminiferal populations in the channel were compared to populations in order Southern California areas. The channel populations was found to be either normal or relatively large. High level dead ratios within the are of relatively large populations suggest that higher rates of productivity caused the large populations. Distribution patterns of Buliminella elegantissima and of four members of the Nonionidae were generally typical of normal portions of the Calfornia mainland shelf. Thus, effluent from Santa Barbara sewer outfall probably was not responsible for increased productivity; growth is attributed to either the presence of oil or some other environmental factor. (See also W71-08776) (Moe-PAI)
W71-08801

HYDROBIOLOGICAL EVALUATION OF STREAM AND NEARSHORE SYSTEMS: FIELD STUDIES,
Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 05A.
W71-08880

HYDROLOGIC EFFECTS OF STRIP MINING WEST OF APPALACHIA,
Geological Survey, Arlington, Va.
D. J. Cederstrom.
Mining Congress Journal, Vol 57, No 3, p 46-50, Mar 1971. 5 p, 3 photo, 5 ref.

Descriptors: *Strip mines, *Strip mine lakes, *Hydrogeology, *Indiana, *Illinois, Acid mine water, Recreation, Strip mine wastes, Spoil banks, Reservoirs, Recharge, Water levels, Flood control, Water resources development, Base flow, Water sources.
Identifiers: Strip mine hydrology.

In the Midwest the problem of acidic water is seemingly much less acute than in Appalachia. In part, this may be due to the fact that the topography is gentle and pyritic material is generally less exposed to oxygenated waters. In Midwest fields, thousands of small lakes have been created in the resultant ridge and furrow topography. These lakes constitute a reservoir of significant magnitude. Further, upon pumping from lakes, saturated bank material, made up of moderately permeable shale fragments or highly permeable sandstone and limestone fragments, will contribute water to the lakes. In this sense, then, the lakes may be thought of as a series of dug wells in which considerable storage is present in each. The ponds and lakes created by disturbed ground are commonly hydrologic benefits in the sense of improvement of the functioning of the hydrologic cycle and also in a secondary sense in that the ponds and lakes are, or can be, distinct recreational assets. (Knapp-USGS)
W71-08899

5D. Waste Treatment Processes

REACTIONS OF A STRONGLY BASIC ION EXCHANGE RESIN WITH DILUTE AQUEOUS SOLUTIONS IN A COLUMNAR SYSTEM,
Michigan Univ., Ann Arbor. Div. of Sanitary and Water Resources Engineering.
William S. Midkiff, and Walter J. Weber, Jr.
Available from the National Technical Information Service as PB-199 643, $3.00 in paper copy, $0.95 in microfiche. Department of Civil Engineering Technical Publication T-69-4, Nov 1969. 136 p, 53 fig, 48 ref, 3 append.

Descriptors: *Ion exchange, Water reuse, Waste water treatment, *Aqueous solutions, Water chemistry, *Separation techniques, Anion exchange, *Resins, Chemical reactions, Kinetics, Chromotography, *Chemical analysis, Ions, Analytical techniques, Mathematical models, Sulfates, Phosphates, Nitrates.
Identifiers: *Reaction zones, Separation zones.

The objective was an engineering evaluation of the use of ion exchange for removal of selected anions from waste water. The research extended to the technology of water conservation with respect to upgrading the quality of municipal waste water treatment plant secondary effluents and storm runoffs for reuse. High molecular weight is not a significant factor in fouling or operational interference of a strong basic anion exchange resin. An organic species must be a counterion before it will penetrate the strong-base resin pore structure to cause foulding. No significant difference in performance was indicated when the one inch column was compared to a column with nine times the surface area. A reaction zone in the column defines the limit of bed depth. As bed depth is increased, chromatographic separation of the ions becomes more prominent. The separate zones become more concentrated and reverse exchange as well as concentration of the less selective ions is enhanced. The reaction zone of the most selective ion is increased with bed depth as an increased competitive ion effect is created with the increased concentration of the less selective ions. A mathematical model has been applied, a modification of one developed by Gleuckauf, combining the effects of equilibrium and kinetics. Analysis of the solute data shows that the more selective the ion, the sharper is the front and the shorter is the reaction zone. The lengths of the reaction zones are in the inverse order from the selectivities. Sulfate has the sharpest front and is followed by phosphate and nitrate.
W71-08391

WATER RESOURCE SYSTEM OPTIMIZATION BY GEOMETRIC PROGRAMMING,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 06A.
W71-08393

CHEMICAL CHARACTERISTICS OF ORGANIC COLOR IN WATER,
Washington, Univ., Seattle, Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W71-08396

PIPELINE FLOW OF SOLIDS-LIQUID SUSPENSIONS,
Syracuse Univ., N. Y.
Raffi Turian, Tran-Fu Yuan, and Giacomo Mauri.
Available from the National Technical Information Service as PB-199 708, $3.00 in paper copy, $0.95 in microfiche. July 1970, 122 p, 13 fig, 9 tab, 40 ref. FWPCA Grant No 17070 DUQ.

Descriptors: *Slurry, *Hydrodynamics, Fluid friction, Pipes, Flow rates, Reynold's number, Headloss, Hydraulics, Suspended load, Particle size, Manometers, Flow meters, Mixing, Pressure, Analytical techniques, Laboratory tests, Statistical analysis, Sludge.
Identifiers: Drag co-efficient, Glass.

Suspensions containing closely sized beads of varying diameters, made from two types of glass, were allowed to flow through 2,1 and 1/2 inch pipelines. Available slurry flow data in 1/2 inch pipe using glass, steel, and lead particles were combined with these data, resulting in a particle size range of from 31 micron up to 4380 micron. There were 12 particle sizes, and particle densities of 2.3, 3.0, 4.4, 7.5 and 11.3 gm/cc, with the entire data set consisting of 1511 points. From these data points, a slurry flow correlation was developed which predicts the slurry friction factor within an absolute average deviation of 9.5% for the entire data collection, with 74 data points having a deviation exceeding 30% and 9 data points with a deviation greater than 50%. Utilization of the correlation involved recasting of the drag coefficient--Reynold's Number relationship into an empirical expression valid for numbers well within the Stokes flow region, and up to nearly the so-called drag crisis. While most of the data presented was taken in the laboratory, published data from two sources (selected after stringent scrutiny) were used to supplement certain ranges of the Reynold's number. (Lowry-Texas)
W71-08397

FIRST NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES PROCEEDINGS.

Copy available from GPO, Sup Doc as SOD No 167.13/4: 12060--04/70, $3.00; microfiche from NTIS as PB-199 709, $0.95. Conference held Apr 6-8, 1970, at Portland, Oregon, Water Pollution Control Series, 12060--04/70 (1970), 400 p. FWQA Program 12060.

Descriptors: *Waste water treatment, Water reuse, *Industrial wastes, Activated sludge, Sludge treatment, Canneries, Aerobic treatment, Oxidation lagoons, Biological treatment, Water pollution control, *Farm wastes, Filtration.
Identifiers: *Food processing wastes.

This was the first of a planned series of conferences to discuss current research on treatment of food processing wastes. This Symposium was co-sponsored by Pacific Northwest Water Laboratory of the Federal Water Quality Administration, the Western Regional Research Laboratory of the U. S. Department of Agriculture, National Canners Association, and Northwest Food Processors Association. The first two days of the conference were devoted to an in-depth review of current research and demonstration projects which have been funded largely by the Federal Water Quality Administration. The third day was concerned with discussions of research on improved in-plant and in-field processing intended to reduce the quantities of waste needing treatment, and replaced the Annual Western Regional Research Laboratory's Collaborators Conference. (See also W71-08399 thru W71-08422)
W71-08398

FEDERAL WATER QUALITY ADMINISTRATION RESEARCH, DEVELOPMENT AND DEMONSTRATION PROGRAM,
Federal Water Quality Administration, Washington, D. C. Applied Science and Technology, Div.
William J. Lacy, and Harold G. Keeler.
Proceedings, First National Symposium on Food Processing Wastes, April 6, 7, 8, 1970, Portland Oregon, Water Pollution Control Research Series No 12060--04/70, p 5-16.

Descriptors: *Waste water treatment, *Wate reuse, Laboratories, *Research and development Technology, Water supply, Eutrophication, Sludg disposal, Nutrients, Microorganisms, Industri wastes, Municipal wastes.
Identifiers: *Demonstration, Renovation.

The efforts on the part of the FWQA to assist mu nicipalities and industries in the prevention o further pollution, and the renovation of waters a ready polluted consist of three major steps. Thes steps are research, development, and demonstr tion and each step plays a vital role in bringi about acceptance of technological improvement The most critical area at present is the industri wastes research. Industrial wastewater volume 2.5 times that of the sewered population, the BOD load is 3 times, and the suspended solids load over two times that of the sewered population, a within the past few years industry's growth rate h been 3 times the growth rate of the sewered pop lation. The expenditures for research laboratori have been and will continue to be the best availab form of investment in the future, for without i creased technology, man would be buried in own waste products. Also, the safeguarding of o fast dwindling water supplies has become impe tive to man's survival. In the future, greater emph sis will come to be placed on non-pollution disposal of sludge and concentrates. Other areas increasing emphasis include dissolved nutri removal, waste water renovation, and re-use, a microorganism removal, particularly viruses. T answers to these problems may well determine question of the survival of man. (See also W 08398) (Lowry-Texas)
W71-08399

STATUS OF R AND D EFFORTS ON FO PROCESSING WASTES,
Federal Water Quality Administration, Corva Oreg. Pacific Northwest Lab.
Kenneth A. Dostal, and Robert J. Barm.
Proceedings, First National Symposium on F Processing Wastes, Apri 6, 7, 8, 1970, Portla Oregon, Water Pollution Control Research Se No 12060--04/70, p 17-26.

Descriptors: *Research and Development, *W water treatment, *Industrial wastes, Grants, W resources development, Technology, Oxida lagoons, Activated sludge, Trickling filters.
Identifiers: *Food processing wastes.

A brief listing of the major Research and Deve ment grants currently being administered in Food Wastes Research program is presen Types of research being funded include researc aerobic lagoons, anaerobic-aerobic lago aerated lagoon oxidation ditches, trickling fi sludge dewatering, waste incineration, a rota biological contactor, ion exchange and others. Types of wastes being studied include and vegetable cannery wastes, slaughterh wastes, milk and cheese processing wastes, beverage wastes. Nearly all Research and Dev ment work done within the scope of authori the FWQA in the food processing field is done through the grant program. As of April,

-50 projects were in various stages of comple-
n, with the FWQA providing $9 million of the
4 million of total estimated project costs. The
od Wastes Division research program is designed
aid in the fight against water pollution by assist-
industry in the development of the technologi-
advances needed. Pollution laws passed by the
leral government are becoming more and more
ngent and harder to comply with, providing
es and court injunctions for lack of compliance.
s program demonstrates the sincerity of the pol-
on control programs by providing industry with
capability for meeting the increased standards.
e also W71-08398) (Lowry-Texas)
1-08400

ATUS AND RESEARCH NEEDS OF POTATO OCESSING WASTES,
kin, Fisher and Associates, Seattle, Wash.
stian Guttormsen, and Dale A. Carlson.
ceedings, First National Symposium on Food
cessing Wastes, Apr, 6, 7, 8, 1970, Portland,
gon, Water Pollution Control Research Series
12060--04/70, p 27-38.

criptors: *Industrial wastes, *Water utilization,
erse osmosis, Activated sludge, Oxidation
ons, Organic loading, Nutrients, Hydrogen ion
centration, Biochemical oxygen demand, By-
ducts, Pilot plants, Ion exchange, Idaho, Waste
er treatment.
tifiers: *Potato wastes, Caustic peeling,
erobic filter.

potato processing industry has experienced un-
lleled growth in the last 2 decades. Along with
large increase in the industry, there has been a
espondingly staggering increase in the amount
aste products produced. At the present time,
age values for the processing of one ton of
toes are 4,200 gallons of water used, with a
esponding effluent of 60 lbs of suspended
ls and 50 lbs of BOD. In 1966, total annual
luction of potatoes was estimated at 15 million
, of which over 35% or 5.25 million tons were
essed. Increased production in the potato in-
ry has caused increased interest in methods of
iating the subsequent pollution. At present,
to processors are faced with having to install
ndary treatment facilities at all of their installa-
s. One method of decreasing the cost of secon-
treatment is reduction of the waste stream it-
Dry peeling of potatoes has been tested on a
l scale, but remains to be proven feasible. If
ble, dry peeling could reduce waste volume
BOD by as much as 50% or more. Also, much
arch work is being done to find new uses for
o solids, such as cattle feed supplements, cul-
media, etc. Technology of the potato waste
ment is such that the pollution control objec-
can be achieved, but much more work
ains to be done before such treatment becomes
ble. (See also W71-08398) (Lowry-Texas)
-08401

OBIC SECONDARY TREATMENT OF ATO PROCESSING WASTES,
ell, Howland, Hayes, and Merryfield, Corval-
reg.
n A. Richter.
ceedings, First National Symposium on Food
essing Wastes, Apr 6,7,8, 1970, Portland,
on, Water Pollution Control Research Series
2060--04/70, p 39-69. 22 fig, 2 tab.

riptors: *Activated sludge, Industrial wastes,
gn criteria, Biochemical oxygen demand,
ogen ion concentration, Temperature, Aera-
Mixing, Chemical oxygen demand, Organic
ng, Nutrients, Idaho, *Waste water treatment,
age treatment, *Aerobic treatment.
ifiers: *Potato wastes, Sludge dewatering,
ended solids.

R. T. French Company of Shelley, Idaho, has
awarded a government demonstration grant
) investigate the feasibility of aerobic secon-

dary treatment of potato wastes; (2) determine BOD removal efficiencies for the system when operated as complete mix activated sludge, a flow-through aeration system without sludge return, and an intermittent aeration system with periods of aeration, clarification, and supernatant draw off. Also included in the tests were: (1) determination of quantity and character of sludge produced; (2) definition of influence of foaming, ice, temperature, pH, nitrogen, and phosphorus on treatment; and (3) cost evaluations. Plant influent averaged 1730 mg/l alkalinity as CaCO3,1680 mg/l BOD, 3050 mg/l COD, 1430 mg/l TSS, temperature of 20C, and pH of 9.3. On the basis of limited testing, inorganic nutrients were present in sufficient amounts. BOD removals of over 90% were obtained for sustained periods, demonstrating the amenability of potato wastes to aerobic biological treatment. pH values were buffered to prevent system upset. Low temperatures were not sufficient by themselves to cause system upset, although significant temperature losses occurred. A detailed analysis of mechanical problems and corrective modifications is presented. The main emphasis has been centered on the need for specialized equipment design for potato wastes. (See also W71-08398) (Lowry-Texas)
W71-08402

USE OF FUNGI IMPERFECTI IN WASTE CONTROL,
North Star Research and Development Inst., Minneapolis, Minn.
Brooks D. Church, and Harold A. Nash.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 71-89. 6 fig, 7 tab.

Descriptors: *Fungi, *Waste water treatment, *Industrial wastes, Microorganisms, Organic loading, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Temperature, Nutrients, Oxygenation, Digestion, Cost analysis, Proteins, Filtration.
Identifiers: Fungi Imperfecti, *Corn wastes, *Soy wastes.

48 SPECIES OF 18 GENERA OF Fungi Imperfecti were studied for conformance to the following qualities: (1) ability for rapid conversion of corn or soy wastes (suspended or soluble) to mycelial protein; (2) ease of removal from digested waste stream by coarse filtration. These various types of fungi were tested in order to find a strain which would economically treat the corn and soy wastes, and at the same time have some economic value. Trichoderma viride, Gliocladium deliquescens, and either Aspergillus oryzae or Gliocladium deliquescens gave best results on corn, soy and SO2-containing soy wheys respectively. Optimal growth conditions included pH of 3.2 to 3.5 and temperatures of 30C. Low oxygen levels of 1 lb O2/6 to 7 lb COD removed were required, and nitrogen and phosphates were required for the corn wastes. Such pH adjustments as were required were accomplished through addition of sulfuric acid. Laboratory scale testing revealed corn waste reductions from 1600 mg/l BOD to 25 mg/l BOD in the effluent after 24 hours, while soy wastes were reduced from 6200 mg/l BOD to 125 mg/l BOD in 36 hours. Mycelial yields averaged 50 to 60 grams of dry mycelial per 100 gm of COD stabilized. Economic analysis was inconclusive, but laboratory scale data indicated a small profit on soy wastes and sale of fungi as animal supplement would defray 85% of the treatment costs of corn wastes. From these initial observations definite evidence is presented that may evolve into commercial scale use of Fungi Imperfecti to remove BOD in a full-scale plant. (See also W71-08398) (Lowry-Texas)
W71-08403

COMBINED TREATMENT OF DOMESTIC AND INDUSTRIAL WASTES BY ACTIVATED SLUDGE,
Cornell, Howland Hayes, and Merryfield, Corvallis, Oreg.
John L. Graham, and John W. Filbert.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 91-117. 19 fig, 1 tab.

Descriptors: *Aerobic treatment, On-site investigations, Evaluation, Cost analysis, *Municipal wastes, *Industrial wastes, *Activated sludge, Chlorination, Design criteria, Organic loading, Alkalinity, Nitrates, Phosphates, Coliforms, Sludge, Flexibility, Odors, Oregon, *Waste water treatment.
Identifiers: *Aerobic digestion, *Shock loading, Clarification, Dallas (Ore).

Conventional approaches to treatment plant design have been found inadequate to provide the necessary degree of treatment, the operational flexibility, and the system stability required. The need for a new system led to the investigation of a completely aerobic scheme of treatment. Such a plant was constructed to handle widely variable combined municipal and industrial wastes, mainly cannery wastes. Average flow through the plant was 2 MGD, with a BOD5 loading of 7,080 lb/day during the canning season, and 2,080 lb/day during the off-season. Various MLSS levels were experimented with ranging from 700 mg/l to 3000 mg/l in the aeration tank. Alkalinity in the influent flow was found to be sufficient to buffer the system. 95% of the time, effluent BOD5 was 7 mg/l or less. Total construction cost of the plant, consisting of aeration basins, final clarifier, aerobic digestion, chlorination, and sludge lagoons was $506,300, as compared to $950,000 for a conventional plant, or a savings of 47%. Operation and maintenance costs were found to be $20/1,000,000 gal. treated, or a 70% savings over conventional treatment. The following additional conclusions were drawn from the initial data: (1) enough process flexibility is provided to handle shock organic loads and abrupt loading changes; (2) no special operating problems were caused in this instance by elimination of primary clarification and grit removal; (3) despite large flow and organic loading fluctuations, effluent quality remained consistently good; (4) aerobic digestion provided adequate stabilization for this combination of sludges at a substantial reduction in cost over conventional treatment. (See also W71-08398) (Lowry-Texas)
W71-08404

AEROBIC TREATMENT OF LIQUID FRUIT PROCESSING WASTE,
Gray and Osborne, Yakima, Wash.
Larry A. Esvelt.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series, No 12060--04/70, p 119-143. 9 fig, 4 tab, 12 ref. FWQA Research and Development Project 12060 FAD.

Descriptors: *Aerobic treatment, *Industrial wastes, Cost analysis, Evaluation, *Canneries, Organic loading, Activated sludge, Sludge, Nutrients, Temperature, Flotation, *Waste water treatment, *Oxidation lagoons.
Identifiers: *Contact stabilization, Polyvinylchloride, Clarification, Process control, Surface aerators.

Snokist canneries has the capability to process 250 tons/day of pears or peaches, and 100 tons/day of apples. Peak processing wastes flows of 2.0 mgd with BOD outputs (after screening) of 20,000 lbs/day are experienced during peach and pear processing. Three different combinations of two basins, aerated lagooning, activated sludge, and activated sludge with sludge reaeration, were studied to determine their applicability to this type of wastes. Equations for biological growth, aeration requirements, and sludge production were derived from reactor kinetics and applied to this problem. All tests performed to evaluate performance conformed to 'standard methods.' From the results of data taken over two processing seasons, the following conclusions were drawn: (1) both activated sludge and contact stabilization, when loaded at

F/m—.4 on a COD basis, will provide greater than 90% removal of organic load and SS, with activated sludge requiring fewer facilities at lesser cost, (2) aerated lagooning provided 70% removal of BOD, but allowed considerable suspended solids loss which contributed most BOD and COD loss. However, cost for such a system was considerably smaller than for either of the other two systems. Actual costs are $.041/No.BOD for aerated lagoons, $.061/No.BOD for activated sludge and $.067/No.BOD for contact stabilization. Surface aeration, and PVC lining were both found to be suitable for use in all three types of systems. (See also W71-08398) (Lowry-Texas)
W71-08405

CANNERY WASTE TREATMENT BY TWO-STAGE AERATION PROCESSES,
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Sciences.
Leale E. Streebin, George W. Reid, and Alan Hu.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 145-175. 14 fig, 5 tab, 1 ref. FWQA Demonstration Grant No 12060 DSB.

Descriptors: *Industrial wastes, *Canneries, Sampling, Design criteria, Aerobic treatment, Organic loading, Flexibility, Odor, Chemical oxygen demand, Biochemical oxygen demand, *Waste water treatment, *Aeration.
Identifiers: Extended acration, Shock loads, Clarification, Volatile suspended solids (VSS).

The Stilwell Canning Company of Stilwell, Oaklahoma processes Irish potatoes, sweet potatoes, blackberries, strawberries, squash, peas, beans, okra, green beans, and other green vegetables. Discharge from the plant previously overloaded the municipal treatment facility by as much as 200%. Data showed that peak output of the plant was 1.5 mgd at a strength of 2250 mg/l of COD. A two-stage aeration process was designed and constructed to treat this waste. A sampling program was developed with sampling points at the Parshall flume, the minimal solids aeration unit, the extended solids acration unit, and after the final clarifier. From the investigation, the two stage aeration system was shown to be capable of accepting shock loads with no adverse affects, partially due to the extreme system flexibility. Recycling of the mixed liquor from the extended aeration system allows minimal solids to be restarted readily. Loading rates varied from an F/m of 1/1 to an F/m of 20/1, while removal ranged from 66 to 99% of the soluble COD. Also, receiving stream D.O. was maintained above 4.0 mg/l over the entire length of the stream for the whole canning season. (See also W71-08398) (Lowry-Texas)
W71-08406

LIME TREATMENT AND IN-PLANT RE-USE OF AN ACTIVATED SLUDGE PLANT EFFLUENT IN THE CITRUS PROCESSING INDUSTRY,
Environmental Engineering, Inc., Gainesville, Fla.
Richard H. Jones.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 177-188.

Descriptors: *Citrus fruits, *Industrial wastes, *Activated sludge, Oranges, Grapefruit, Sludge, Organic loading, Biochemical oxygen demand, Chemical oxygen demand, Dissolved oxygen, Nutrients, Lime, Sedimentation, Centrifugation, Aeration, *Water reuse, *Waste water treatment.
Identifiers: Hydraulic loading, Suspended solids, *Lime treatment.

Winter Garden Citrus Products Co-operative was given 6 weeks in which to find an acceptable treatment method for their wastewater or shut down their operation. On the basis of a 4 week laboratory scale study and no pilot scale study, an activated sludge plant incorporating lime treatment of the effluent to provide subsequent re-use as barometric leg water and cooling water, was designed and built. Orange and grape fruit wastes per box (90 lbs of fruit) were 25 gallons of concentrated waste water containing 1/4 lb of BOD. The new plant was designed to treat 2 mgd averaging 2000 mg/l of BOD. Waste water loads varied with the availability of fruit, with flow ranging from 1.5 mgd to 0.00 mgd, and from .04 lbs BOD/lb MLSS to .378 lbs BOD/lb MLSS, with a seasons average of .143 lbs BOD/lb MLSS. It was determined that the plant was loaded to approximately 60% of capacity both hydraulically and organically. The following conclusions were obtained after one season of operation: (1) 99% organic removal efficiency is possible using the complete mixed activated sludge process to treat citrus wastes; (2) effluent from the treatment system can be re-used in the plant, and waste sludge and peel can be used as cattle feed; (3) slug additions of orange oil and peel press liquor disrupt treatment efficiency and cause heavy foaming; (4) extensive daily testing must be utilized to determine nutrient requirements due to the highly variable load; and (5) high excess solids production must be considered as a key factor. (See also W71-08398) (Lowry-Texas)
W71-08407

CANNERY WASTE TREATMENT BY A HIGH SOLIDS ACTIVATED SLUDGE PROCESS,
FMC Corp., Santa Clara, Calif.
Warren G. Palmer.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series, No 12060--04/70, p 227-259. 15 fig, 4 tab, 3 ref. FWPCA Research and Development Grant No 12060 EZP.

Descriptors: *Activated sludge, *Pre-treatment (Water), Industrial wastes, *Canneries, Sludge, Oxidation, Organic loading, Aeration, Digestion, Biochemical oxygen demand, Hydrogen ion concentration, Phosphorus, Nitrogen, *Waste water treatment.
Identifiers: Kehr activated sludge process, *Shock loading, Mixed liquor suspended solids (MLSS), Total organic carbon.

The Kehr modification of the activated sludge process was studied in comparison to the conventional activated sludge process to determine its applicability for industrial waste treatment. The Kehr Activated Sludge Process (KASP) consists of an activated sludge process with a MLSS concentration of 10,000 to 14,000 mg/l, an aeration time of 6 hours and no controlled sludge wasting. Laboratory scale testing runs using a 120 gal aeration tank, were conducted. It was determined that KASP has the following advantages (1) because of the high solids concentration, a smaller volume of aeration tank is required to effect the same BOD removal, (2) the high solids concentration provides increased buffering alkalinity, and (3) KASP was able to go for extended periods with no loading, or undergo periods of slug or 'shock' loading with little adverse effect. On the other hand, KASP does not remove either nitrates or phosphates, and the percent reduction of TOC is also less than can be achieved by conventional plants. From the preceding analyses, the Kehr-Activated Sludge Process appears to have considerable application in industrial situations where widely varying hydraulic and organic loads are encountered, possibly as a pretreatment process. Pilot scale investigations are recommended prior to design to determine design parameters for each individual waste. (See also W71-08398) (Lowry-Texas)
W71-08409

CONCENTRATION OF SUGARBEET WASTES FOR ECONOMIC TREATMENT WITH BIOLOGICAL SYSTEMS,
Beet Sugar Development Foundation, Fort Collins, Colo.
Ronald W. Brenton, and James H. Fischer.
Proceedings, First National Symposium on Foo
Processing Wastes, Apr 6,7,8, 1970, Portlan
Oregon, Water Pollution Control Research Serie
No 12060--04/70, p 261-280. 10 fig, 2 tab, 6 ref.

Descriptors: *Sugar beets, *Industrial waste
*Waste water treatment, Ponds, Sedimentatio
Oxidation, Aeration, Mixing, Nutrients, Dissolv
oxygen, Hydrogen ion concentration, Biochemic
oxygen demand, Chemical oxygen demand, Odo
*Water reuse.
Identifiers: *Facultative lagoon, Flume water.

Sugar beets provide 30% of the sugar used in t
United States. An average of 2200 gallons of wa
is required per ton of sugar beets for fluming a
washing operations. Effluent wastes are discharg
from four major sources as: (1) flume water; (
process water; (3) lime cake drainage; and (
Steffen or final waste when the Steffen process
used. A two year study on the containment, tre
ment, recirculation, and re-use of sugarbeet flu
ing and washwater was conducted within the ind
try. The particular system studied included two
ternately used first-ponds in series with a secc
pond. Removals of BOD and suspended sol
average 20 and 54% respectively, with the wa
continually increasing in BOD, COD, and total
solved solids the more it was recirculated. At
end of the processing season, system and surp
waters of initial 3000 ppm BOD and 6000 ppm
solved solids were discharged into a 1.8 surf
acerage, 15 ft deep pond having two surface a
tors, and degraded to 50 ppm BOD and 4 ppm D
Facultative instead of anaerobic digestion
longed the digestion period to 31 weeks. Inorg
nutrients were limiting, and were added
required. Water was not discharged from the
pond but used as fluming and wash water du
the next processing campaign. Control of temp
ture and pH is vital to odor control. Settle
solids can be removed but solids handling prod
greater odor problems which remain to be sol
(See also W71-08398) (Lowry-Texas)
W71-08410

**RECONDITIONING AND REUSE OF OL
PROCESSING BRINE,**
National Canners Association, Berkeley, C
Western Research Lab.
A. Walter Mercer.
Proceedings, First National Symposium on
Processing Wastes, Apr 6,7,8, 1970, Port
Oregon, Water Pollution Control Research S
No 12060--04/70, p 281-293. 6 fig, 3 tab.

Descriptors: *Brines, *Chemical oxygen dem
Hydrogen ion concentration, Acidity, Color
tivated carbon, Economic feasibility, *Waste
treatment, *Water reuse.
Identifiers: *Suspended solids, *Olive brine,
wastes.

The olive brines used were upgraded by usin
tivated carbon treatment. A brine reconditi
unit was constructed at four canneries.
storage brines were put through the carbon c
at a rate of 0.5 to 3.5 gpm. Measurement of
SS, pH, total acidity, and color were take
shown in figure 5. Significant change in pH,
and total acidity was noted at the addition o
carbon. Effluent was transparent, at 42
limicrons wave length, until 6000 gallons o
contacted 1000 lb of activated carbon. The
mittance decreased to 75% at 10,000 gallo
decreased due to the carbon acting as a filte
tabulated results indicate that carbon trea
reduced COD and color but had little effect
total acidity, salt content, and SS. Results o
ment of two types of processing water are tab
and show that the Lye rinse water and the tra
brine experienced a substantial reduction in
COD. Both rinse waters were reused with
tectable effect on the quality of the product
storage of freshly harvested olives in carbon
brine was done and proved to be successful.
stage plan is suggested with a calculated c
brine treating of $0.50 per ton of olives for t

ge and $1.00 for the second stage. (See also 71-08398) (Rayyan-Texas)
71-08411

RICKLING FILTER TREATMENT OF FOOD ANNING WASTE WATERS,
tional Canners Association, Berkeley, Calif.
Walter Rose.
oceedings, First National Symposium on Food ocessing Wastes, Apr 6,7,8, 1970, Portland, egon, Water Pollution Control Research Series, 12060--04/70, p 295-310. 9 fig, 3 tab.

scriptors: *Trickling filter, *Plastic, Toxicity, drogen ion concentration, Organic loading, emical oxygen demand, Biochemical oxygen de- nd, Biochemical oxygen demand, Nutrients, 'aste water treatment, Filtration, *Canneries, In- strial wastes.
ntifiers: Depth of packing, Food wastes.

ne conditions resulting in inadequate treatment ng provided by trickling filters are: sudden nge of volume and character of waste, haulting operations, deficiency of nutrients, and high ncentration of carbohydrates. These observa- ns were made during evaluation of the new stic filled trickling filters. The factors responsi- for actuating this research on these new filters wastes with high concentrations of soluble ds, necessity for microbial removal of soluble ds, need for high rate space saving treatment thod capable of withstanding high organic dings while still providing efficient removal. The ameters studied were: (1) toxicity, (2) rients, (3) pH, (4) organic loadings, and (5) th of packings. A description of this filter is en along with tables showing its performance ler constant and variable loadings. A high or low resulted in poor performance. The acceptable range was 6.5 to 8.0. An increase in the applied d caused a decrease in percent of BOD removal. lescription with an illustrative drawing of the ond filter which was used to study the effect of depth of packing on removal is given. The ults which are plotted in two curves show that removal was disproportionate to depth. This attributed to hydraulic loading 0.44 gpm/l sq. of cross sectional area and the use of high car- ydrates products. A description of the third r which used forced aeration is given. It was nd that the air flow rate is proportional to COD oval. Results of this study are tabulated. (See W71-08398) (Rayyan-Texas)
1-08412

OD PROCESSING WASTE TREATMENT BY RFACE FILTRATION,
npbell Soup Co., Camden, N.J.
Louis Gilde.
ceedings, First National Symposium on Food cessing Wastes, Apr 6,7,8, 1970, Portland, gon, Water Pollution Control Research Series, 12060--04/70, p 311-326. 4 fig, 2 tab, 5 ref.

criptors: *Filtration, *Biochemical oxygen de- nd, *Nitrogen, Phosphorus, Agriculture, Cli- ology, Hydrogen ion concentration, Impervious s, Slope, Terraces, Conductivity, *Waste water tment.
ntifiers: *Food processing wastes.

s is a new overland flow technique by which ers sprayed on impervious or semi-pervious become purified by flowing through vegetative r on the surface of the soil and collect in ter- s at the bottom of slopes. A 3.5 MGD flow of te water is treated at the Paris, Texas factory of npbell Soup. A thorough description of this fac- is given. The study included climatology, ogy, chemistry and agriculture. The climatolo- study indicated remarkable similarity to the ther bureau records in the east. Thus the latter ld be used in predicting the grass growth rate in e areas. Analysis of the grass grown on the osal site showed high nutritional values ranging o 23% protein with the hay value being about 8% of the operating cost. Analysis of the effluent indicated a 99% BOD, 90% nitrogen and 45% phosphorus removal. However, a long rest period resulted in 90% phosphorus removal without affecting the BOD or nitrogen. The pH (constant, neutral effluent) and the electric conductivity are illustrated in two figures. A summary of the hydrological data is given. Biological studies indicated that as temperature decreases the number of organisms increases. A 175 ft. down hill slope with a 2%-6% pitch was found to provide sufficient treatment. (See also W71-08398) (Rayyan-Texas)
W71-08413

BIOLOGICAL TREATMENT OF FOOD PROCESSING WASTES,
Stanford Univ., Calif.
Perry L. McCarty.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series, No 12060--04/70, p 327-348. 5 fig, 1 tab, 18 ref.

Descriptors: *Biological treatment, *Aerobic conditions, *Anaerobic conditions, Microorganisms, Kinetics, Bacterial, Utilization, Sludge, Nutrients, Methane, Growth rate, Decay rate, Substrate, Velocity, Filter, Fungi, Organic, *Waste water treatment.
Identifiers: *Food processing wastes.

This is a summary of the basic principles of biological treatment which have been applied and discussed during the symposium with emphasis on an aerobic process. The major factor in designing a biological treatment system is the reproduction rate of the microorganisms involved. Failure point of the process could be evaluated by considering the kinetics of bacterial growth and waste utilization. A discussion with illustrative drawings and tables ot these factors is presented. Formulas with discussion on excess sludge production, nutrients, and air requirements and methane production are given. The generally used factor of safety against failure is 3-20 times the minimum solid retention time. The biological growth rate coefficient for aerobic system is .3-.4 lb per lb BOD5 or COD consumed and the organism decay rate is .02-.06 per day. The maximum substrate removal velocity was 4-24 lb BOD5 per day per pound of microbial mass. The substrate removal velocity indicates that more waste could be treated per day in a given reactor by increasing the concentration of microorganisms or mixed liquor volatile solids. The anaerobic process has not been widely used. A new system called the anaerobic filter has been developed. A discussion on the operation of this filter is presented with the conclusion that it seems ideal for many food processing wastes but more studies are needed. Comments on food processing waste treatment are presented. (See also W71-08398) (Rayyan-Texas)
W71-08414

WURDD'S TASK FORCE ON AGRICULTURAL POLLUTION,
Agricultural Research Service, Albany, Calif. Western Utilization Research and Development Div.
J. Peter Clark.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 347-349.

Descriptors: *Pollution, *Foods, *Water reuse, Toxicity, Oil, Brines, Environment, Water pollution control, Waste water treatment, *Farm wastes.

The plan of action and the specific research of the task force of WURDD is presented along with a general introduction to some other pollution related research conducted by the division. Modifying food processing is a most promising approach to reducing pollution from agriculture. The general principle to this concept is minimize water use, recycle water or other liquids where possible, put as much of the raw material into the final product as possible, and make soluble material from whatever cannot go in the primary product. The author considers the present waste stream analysis by the measurement of BOD, COD, SS, etc. inadequate and suggests the analysis of the composition of the stream and its relationship to the environment. Some of the studies done by the division are those on the wastes of castor oil which used to be believed toxic to all animals but was found to be a good nutrient for fish. Also, the study on enzymes and the possibility of growing the useful ones on waste streams and using enzymes to convert or treat waste streams is mentioned along with other current studies. (See also W71-08398) (Rayyan-Texas)
W71-08415

IN-FIELD PROCESSING OF TOMATOES,
Agricultural Research Service, Albany, Calif. Western Utilization Research and Development Div.
R. Joseph Wayna.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series, No 12060--04/70, p 350-354. 1 fig, 8 ref.

Descriptors: *Harvesting, *Tomatoes, Hydrogen ion concentration, Heating, Acid, Solid wastes, Waste water, Cooling, *Waste water treatment.
Identifiers: Food wastes.

5-7 million tons of tomatoes of which 90% are machine harvested are delivered annually to the canneries in the U. S. A description of the machine harvesting and economical and ecological advantages and disadvantages are discussed. It was found that the best way to achieve the utmost yield with the least waste from tomatoe processing is to reduce the in-transit and holding periods by processing the tomatoes in the rural harvesting areas. A tomato processing unit was built with the objective of field processing and the application of a new acidified tomato juice. The unit performed the following: (1) preparation of tomatoes, (2) hot-break for rapid enzymes destruction, (3) the optional acid treatment, and (4) pulping and cooling. It was found that prompt processing resulted in a 6-12 % increase in product yield. Also, an increase of 4% solids recovery resulted from the use of acid extration and heat treatment over the use of heat treatment alone. All waste material including waste water was disposed on nearby farm land. Juice is the only product to be transported. For stability purposes and at neutral pH (4.4) the juice should be chilled to 40F but it could be held for 24 hours at 70F at a pH of 2.75 without any significant effects. (See also W71-08398) (Rayyan-Texas)
W71-08416

DRY CAUSTIC PEELING OF VEGETABLES AND FRUITS,
Agricultural Research Service, Albany, Calif. Western Utilization Research and Development Div.
P. Robert Graham.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series, No 12060--04/70, p 355-358. 2 ref.

Descriptors: Infrared, Heating, Brushing, *Potatoes, *Fruit, Water pollution control, Economics, *Waste water treatment, Farm wastes, Vegatable crops.
Identifiers: *Food wastes.

The study of the dry caustic peeling was done on white potatoes. The process is described in detail but could be summarized by: (1) potatoes are treated with hot lye; (2) they are subjected to infrared heating; and (3) they are then brushed. The experimental unit was composed of a live-roller conveyer, infrared burners and rubber tipped rolls for peeling. The amount of peel removed could be controlled by the caustic dip time. No heat rings were produced under proper conditions. Peeled

potatoes were dipped in sulfite to prevent darkening. Peeling conditions for sweet potatoes are the same as those for white potatoes except the brushing state following the stud rubber peeler is somewhat critical. As for fruit, a caustic chip similer to that used for conventional peeling is used with a rubber disk peeler and no infrared heating. This method proved to be successful on peaches, pears, and apricots. In general the dry caustic peeling method helps in keeping the peel material from entering the plant effluent as well as resulting in revenue in excess of the savings through control of water pollution. (See also W71-08398) (Rayyan-Texas)
W71-08417

PILOT PLANT EXPERIENCES OF USDA-MAGNUSON DRY CAUSTIC PEELING PROCESS,
Magnuson Engineers, Inc., San Jose, Calif.
J. Traver Smith.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--4/70, p 359-361.

Descriptors: Infrared, *Waste water treatment, *Solid wastes, Pilot plant, *Potatoes, Fruits, Hydrogen ion concentration, Idaho, Farm wastes.
Identifiers: *Caustic peeling, Magnuscrubber, Magnubrusher, Food wastes.

This pilot plant of dry caustic peeling was constructed at Aberdeen, Idaho. The units used were: (1) small ferris wheel type conventional caustic dip units holding belt; (2) infrared unit, (3) magnuscrubber, and (4) magnubrusher. The product used was white potatoes. Caustic solution of 12% with one minute dip was used. The peel waste was of 23-25% solids at pH 11. Potatoes were dipped briefly in a 0.5% sodium bisulphite solution to fix the color. The infrared caustic peeling process definitely accomplished the objective of keeping the peel waste out of the plant waste water. Other advantages include reduction of chemical required reduction of peel waste, and production of whiter and non-slippery processed potatoes. Processing of sweet potatoes using the Magnuson equipment was also found to be successful. Other products are still in the experimental stage. Dry caustic peeling is also called, 'USDA-magnuson anti-pollution peeling system' and also 'infrared caustic peeling.' (See also W71-08398) (Rayyan-Texas)
W71-08418

POSSIBLE USES OF UNI-FLOW FILTER,
Agricultural Research Service, Albany, Calif. Western Utilization Research and Development Div.
Karel Popper.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 362-376.

Descriptors: *Filters, *Pressure, *Solid wastes, Liquid wastes, *Cotton, *Waste water treatment, Economics, Farm wastes, Water reuse.
Identifiers: Suspended solids.

The idea of the uni-flow is to remove some of the noxious material from the effluent at low cost and render the effluent valuable or reusable. The uni-flow utilizes the idea of low pressure to separate solids from liquids by the use of cotton tubing (or nylon tubing). A description of the unit is given with illustrative pictures. An example with discussion on the use of the unit in water softener regenerant is presented. Another example is the use of the unit on wine lees. A 50 gpm unit at a cost of $800 was built. Economic study showed that through use of this unit a recovery of 1000 gallons of wine will require an expenditure of one cent in facilities. The unit was used successfully on potatoe starch with a SS removal of 98%. Other examples of the use of the unit are given. (See also W71-08398) (Rayyan-Texas)
W71-08419

A CASE HISTORY IN FOOD PLANT WASTE WATER CONSERVATION AND PRETREATMENT EXPERIENCE,
Artichoke Industries, Inc., Castroville, Calif.
Granville Perkins.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 377-382.

Descriptors: *Precipitation, Flotation, Biochemical oxygen demand, Hydrogen ion concentration, Hydraulic flow, *Waste water treatment.
Identifiers: Suspended solids, *Food wastes.

This is the history of the waste water treatment problem in an artichoke plant in Castroville, California. The plant started in 1955 using the Castroville County treatment plant which was designed at an average capacity of 300,000 gpd and peak hydraulic load of 900,000 gpd. The plant flow in 1955 was 100,000 gpd and jumped to 400,000 gpd in 1958. A water re-use program reduced the flow to 300,000 gpd but BOD increased from 1500 ppm-4000 ppm. In 1964 an ordinance limiting the gallons of waste and pounds of BOD per industry was issued. The limit of the artichoke plant was 60,000 gpd and 240 lb of BOD at no fee. A consultant was hired to study pretreatment. The result was a chemical precipitation system. This system started operating in 1967 and after one year the value went down to 80,000 gpd with a BOD between 600-1000 ppm. Due to chemical addition the pH jumped from 5.5 to 11 which caused the malfunctioning of the clarifiers of the district treatment plant. Stopping the addition of chemicals allowed the clarifiers to start functioning again but the BOD jumped to 2000 ppm. A new consultant was hired and he suggested flotation of the SS followed by precipitation. This is now under way by converting the 6000 gallon precipitator into an 8000 gallon clarifier. (See also W71-08398) (Rayyan-Texas)
W71-08420

ANIMAL FEEDS FROM VEGETABLE WASTES,
Agricultural Research Service, Albany, Calif. Western Utilization Research and Development Div.
O. George Kohler.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6,7,8, 1970, Portland, Oregon, Water Pollution Control Research Series No 12060--04/70, p 383-387.

Descriptors: *Lignin, *Digestion, Alkali treatment, Dehydration, Grass, Vegetable crops, *Farm wastes, Economic feasibility, *Waste water treatment.

This is a program report on two agricultural waste problems: The lignified cellulosic material and the non-edible green waste. Lignin, an indigestible substance is associated with the cell wall cellulose and hemicellulose and tends to decrease their digestability. This digestability could be improved by processing straws through treatment. Alkali treatment of a variety of lignified cellulosic wastes and manure improved their digestibility. Studies on the cauliflower plants using a Freeze-dried method indicated that the leaf fraction is a promising poultry feed (28% protein and 12.5% fiber), while the stem fraction is good as a cattle feed with 86.3% digestibility. Economic evaluations of treated straw products and cauliflower waste products are being carried out by computer. (See also W71-08398) (Rayyan-Texas)
W71-08421

RICE HULL UTILIZATION,
URS Research Co., San Mateo, Calif.
Milton Staackmann.
Proceedings, First National Symposium on Food Processing Wastes, Apr 6, 7, 8, 1970, Portland, Oregon, Water Pollution Control Research Series, No 12060--04-70, p 387-390.

Descriptors: *Burning, *Dumping, *Rice, Fue Cellulose, Silica, Portland cement, Structur Architecture, Evaluation, *Waste water treatmen Farm wastes.
Identifiers: Water glass.

A million tons of rice hulls are produced annual in the U. S. and are disposed of either by open b burning or dumping. Both methods are becomi ever more unattractive. The USR company h done a study for USDA examining the technic and economic feasibility of utilizing the rice hul The areas examined were: (1) concepts making u of both the fuel value of the organic (cellulos portion of the hulls and the silica contents, (2) co cepts utilizing both the structural characteristi and the unique texture of the rice hulls and (concepts combining both of the above concep The first concept was examined with portland c ment production and found economically unfea ble. However, the use of rice hulls in water gl production using the Zimmerman process would economical. The second concept was examined producing boards for architectural use wh proved uneconomical. The combined conc plant having two main processing facilities, c producing sodium silicate, and the other archit tural boards using sodium silicate as binder see to be economical and should be studied furth (See also W71-08398) (Rayyan-Texas)
W71-08422

CHARACTERISTICS AND KINETICS BIOLOGICAL FIXED FILM REACTORS,
Clemson Univ., S.C. Environmental Systems gineering.
Billy H. Kornegay, and John F. Andrews.
Available from the National Technical Informa Service as PB-199 834, $3.00 in paper copy, $0 in microfiche. 1970. 212 p, 45 fig, 32 tab, 115 FWPCA Research Grant No WP-01181, Prog 17050--00/70.

Descriptors: *Trickling filter, *Design crit *Kinetics, Dissolved oxygen, Mixing, Satura Diffusion, Biodegradation, Oxidation, Mathen cal models, Microorganisms, Waste water t ment.
Identifiers: *Biological bacterial film, *Plug f Glucose, Thickness, Suspended solids.

The kinetics of biological slime films were vestigated using six completely mixed, an reactors. Design criteria for trickling filters formerly based on experience and guesswor this investigation attempted to determine kinetics of a simple system to provide a better for establishing trickling filter design criteri simple glucose and mineral base substrate wa to microorganisms attached to the walls of the nular, completely mixed reactors. The rea were operated first in parallel, for a basic inve tion of biological film kinetics, and second, ries, to approximate plug flow. Completely reactors eliminated channeling, dissolved o and substrate gradients, and the interdepend of velocity and flow. Film development uniform, and liquid channeling did not occur investigation revealed that biological films de in three distinct stages: (1) logarithmic g which lasted until the active thickness was rea (2) linear growth, between the active thickne the plateau thickness; and (3) zero growth, new cells are washed away. The active thickness averaged 70 and was independent O. Kinetic equations were developed which sh good correlation between theoretical and obs data. On this basis, a trickling filter design tion, based on the kinetics of the proces developed. (Lowry-Texas)
W71-08423

AN INVESTIGATION OF INDUSTRIAL MUNICIPAL WASTE WATER QUAN COMPOSITION, AND TREATMENT IN REEDY RIVER BASIN,
Clemson Univ., S.C. Environmental Syste gineering Program.

mes M. Campbell.
S Thesis, Clemson University. 60 p, 9 fig, 3 tab, ref. OWRR Project B-017-SC (2).

escriptors: Water quality control, *Waste assimilative capacity, Industrial wastes, Municipal astes, Nutrients, Color, Toxicity, Biochemical oxen demand, Hydrogen ion concentration, Dissolved oxygen, Aeration, Odors, Analytical chniques, Tertiary treatment, Sewers, *Waste ter treatment, South Carolina, *Water pollution urces.
ntifiers: *Reedy River Basin, Textile wastes.

lustries and municipalities discharging treated or treated effluents into the Reedy River Basin re surveyed as to waste volume, strength, and er characteristics. By conventional evaluations D. O., BOD, and pH, the River was in acceptable ndition. Visual observation discounted the alytical evidence, however, and it was deterned that the tests developed primarily to muipal wastes were not applicable to the strong tex- wastes being discharged to the basin. As a result he data gathered from the questionnaires, it was cided that there were four choices open to the in authority, including: (1) expansion of existing nts; (2) construction of an all new regional plant combined municipal and industrial wastes; (3) nstruction of a new, centralized textile waste atment plant to handle most of the industrial tes in the area; and (4) pumping all wastes into Reedy River Basin, and adding artificial aera- and odor control to the river, since it would be entially an open sewer. The last alternative, ng by far the least expensive would probably be hibited by state and federal law, public opinion, aesthetic value loss. No one system has been igned and evaluated for construction as yet, but alternatives are clearly established. (Lowry-as)
1-08424

ERATURE SURVEY: THE USE OF BACRIA AS INDICATORS OF FAECAL POLLUON IN WATER,
ncil for Scientific and Industrial Research, Pre- a (South Africa). National Inst. for Water earch.
primary bibliographic entry see Field 05B.
1-08425

YCOLYTIC AND RELATED ENZYMES IN OSTRIDIAL CLASSIFICATION,
ncil for Scientific and Industrial Research, Pre- a (South Africa). National Inst. for Water earch.
. Kotze.
plied Microbiology, Vol 18, No 5, p 744-747, 1969. 22 ref.

criptors: *Clostridium, *Separation techniques, alytical techniques, *Enzymes, Oxidation reduc- potential, Metabolism, Digestion, Fermenta-, Degradation, Sampling, Filtration, Nitrogen g bacteria, Bacteria, Microorganisms, Carydrates, Biochemistry, Waste water treatment.
tifiers: Differentiation, Citric acid cycle, Inulation.

fferent enzyme activities namely 6-PFK, LDA, -PDH, 6-6-PDH, 1 CDH, and MDH were utilto differentiate among the following clostridi- strains: (1) CE 30; (2) CE 3; (3) steurainum, (4) AB-6-7, (5) C.butyricum; (6) auvoei; (7) C novyi, and (8) C. septicum. This erentiation was made possible by the fact that strain shows characteristic enzymatic activity. he organisms studied, all contained 1-phosphokinase (1-PFK); three lacked 6-PFK and man- 1-phosphate dehydrogenase. The hexose ophosphate shunt was present in 6 clostridia, rmined by the presence of glucose 6-phosphate ydrogenase. Clostridium septicum was the only nism studied which gave indications of posing the full critic acid cycle, with most of the r strains either the first of the four carbon part only the active segments. The advanced detection methods have made differentiation of different strains by the enzymatic activity method a useful and accurate laboratory tool. (Lowry-Texas)
W71-08426

RECOVERY OF MICA FROM SILT DEPOSITS IN THE NOLICHUCKY RESERVOIR, TENNESSEE,
Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Center.
Ralph B. Adair, and Jerome O. Crabtree.
Bureau of Mines Report of Investigations RI 7488, Mar 1971. 9 p, 2 fig, 9 tab.

Descriptors: *Reservoir silting, *Mine wastes, *Desilting, *Silicates, *Tennessee, Byproducts, Mining, Reservoirs, Dredging, Sedimentation, Mineralogy.
Identifiers: *Mica, *Nolichucky reservoir (Tenn).

The Bureau of Mines conducted laboratory batch and small-scale continous tests on samples of silt from the Nolichucky Reservoir near Greenville, Tenn., to develop a process for the recovery of commerical-grade muscovite concentrates. Using a combination of Humphreys spirals for preconcentration followed by cationic flotation, 94.5% of the muscovite was recovered in a product containing 96.5% muscovite. Based on sedimentation soundings over the years, approximately 61.88 million cubic feet of mica-laden sediments lie above the present maximum pool level. Using the 61.88 million cubic feet and a measured average density of 75 pounds per cubic foot, this would indicate a minimum of 2.32 million tons of mica-bearing silt. Using 11% mica, as determined by average sample grade, this represents 255,200 tons of mica. It should be noted that the estimate is based on an average depth of 6.34 feet, whereas most of the deposits extend to depths of over 20 feet, and that deposits below the water line could not be sampled. (Woodard-USGS)
W71-08523

THE EFFECT OF DETERGENTS ON GAS ABSORPTION PROCESSES,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
Jerry A. Caskey, Ralph F. Herbert, and Yan Pui To.
Available from the National Technical Information Service as PB-199 830, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center Bulletin No 35, Apr 1971. 58 p, 20 fig, 36 ref, append. OWRR Project A-025-VA (2).

Descriptors: *Surfactants, *Absorption, *Surface tension, *Detergents, Carbon dioxide, *Oxygenation.
Identifiers: *Interfacial resistance.

Although many studies have been made showing that surfactants can lower gas absorption rates the mechanism by which this occurs is not known. The purpose of this investigation was to show what effect the hydrophilic functional group has on gas absorption rates. Four different biodegradable surfactants were used. All four are used in commercial formulations. All four surfactants also had a linear hydrophobic group of 12 carbon atoms. In addition the position of the hydrophilic functional group was studied using 1-octanol and 4-octanol. Pure surfactants were used so that the interfacial resistance could be related to the surface concentration by means of Gibbs' adsorption isotherm. A quiescent liquid manometric gas absorption cell was used for the study. Carbon dioxide and water were used as the absorption system. Dodecyl sodium sulfate, dodecyl benzene sodium sulfonate, dodecyl diethanol amide and dodecyl diglycol amide were the four surfactants studied with different hydrophilic groups. The interfacial absorption resistance caused by the surfactant decreased with increasing molecular weight of the hydrophilic portion of the molecule. The interfacial resistance increased as the hydrophilic group moved from the end toward the center of the linear alkyl hydrophobic chain. (Caskey-VPI)
W71-08592

MARINE FOULING IN POWER STATIONS,
Central Electricity Generating Board, Southampton (England). Marine Biological Lab.
Nicholas Holmes.
Marine Pollution Bulletin, Vol 1 (NS), No 7, p 105-106, July, 1970.

Descriptors: *Chemcontrol, *Fouling, *Mussels, *Cooling water, *Chlorination, Invertebrates, Mollusks, Shellfish, Worms, Annelids, Tubificids, Environmental engineering, Thermal stress, Equipment, Water cooling, Water pollution sources, Inhibitors, Protective coatings, Chlorine, Treatment, Water flow.
Identifiers: Barnacles, Hydroids, Balanus sp., Antifouling paint, Byssus threads.

The biological fouling problem in seawater coolant systems of electricity generating plants is briefly reviewed. Four preventative measures are discussed: periodic flushing with heated water, flushing with fresh water, use of antifouling paints, and continuous chlorination. The last is considered to approach the ideal as an industrial technique, because it is fairly cheap, is very effective, and has a minimal effect on the environment. (LeGore-Washington)
W71-08598

MUSSEL FOULING IN CHLORINATED COOLING SYSTEMS,
Central Electricity Generating Board, Southampton (England). Marine Biological Lab.
N. Holmes.
Chemistry and Industry, p 1244-1247, 26 Sept, 1970. 8 fig, 2 ref.

Descriptors: *Chemcontrol, *Fouling, *Mussels, *Chlorination, *Cooling water, *Water flow, *Inhibitors, Invertebrates, Mollusks, Shellfish, Environmental engineering, Equipment, Water cooling, Water pollution sources, Chlorine, Treatment, Biochemistry, Physiological ecology, Animal physiology, Environmental effects, Commercial shellfish, Industrial water.
Identifiers: *Marine engineering, Power plant design, Byssus threads, Mytilus edulis.

The fouling problem presented by mussels in marine cooling water systems is discussed with emphasis on settlement and on byssus thread formation. The chlorinated cooling systems of two power stations are described, and mussel fouling within them is localized relative to water flow rates present. Both power plants are closed down for several hours each night, implying that the flow-dependent fouling patterns were due to differential removal of settled mussels as well as to differential obstruction of larval settlement. It is suggested that mussel control is accomplished in chlorine residuals of 0.5 mg/l at average water speeds greater than 1.5m/sec. This is attributed to partial interference of byssus thread formation by chlorine, resulting in the mussles' inability to effectively attach to the substrate. (LeGore-Washington)
W71-08599

MERCURY CONTENT OF VARIOUS BOTTOM SEDIMENTS, SEWAGE TREATMENT PLANT EFFLUENTS AND WATER SUPPLIES IN WISCONSIN (A PRELIMINARY REPORT),
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05B.
W71-08609

TREATMENT OF AQUEOUS AGRICULTURAL WASTES FOR CLEAN WATER AND FOR MICROBIAL PROTEIN PRODUCTION,
Iowa State Univ., Ames. Dept. of Chemical Engineering.
G. T. Tsao.
Available from the National Technical Information Service as PB-199 912, $3.00 in paper copy, $0.95

in microfiche. Iowa State Water Resources Research Institute, Ames, Completion Report ISW-RRI-33, Engineering Research Institute ISU-ERI, Ames-99959 April, 1971, 34 p, 27 fig, 12 ref. OWRR Project A-032-IA (6).

Descriptors: Oxygen, Absorption, *Foaming, *Aeration, *Cytological studies, Farm wastes, Waste water treatment, *Biological treatment.
Identifiers: Waldorf aerator, Cell growth, *Whey.

Cheese whey containing 35,000 ppm BOD is the most concentrated liquid waste that can be found in large quantities. It foams excessively when bubbled with gas. Cheese whey was successfully treated in a Waldhof aerator by Saccharomyces fragilis. This yeast can reduce about 85% of the BOD and produce single cell protein. A batch as well as a continuous growth process of this yeast was successfully developed. A fundamental study on the transient and steady state behavior of cell growth was also conducted. Through computer simulation, it was possible to predict growth pattern in batch and continuous processes. Oxygen is important in any aerobic biological process. The Waldhof aerator not only provides good aeration for yeast growth, but is also capable of handling highly foamy liquors like whey through its foam recycling mechanism. A sysmetical study on the working mechanisms of a Waldhof aerator was conducted. Foam fractionation of the yeast and other microbiological cells was also studied. Foam decay was found to follow a second-order rate pattern. A theoretical investigation was conducted on gas-liquid interfacial oxygen absorption. The effect of viable microbiological cells that consume the transferring solute on the rate of oxygen absorption was analyzed.
W71-08661

DISPOSAL OF WASTES FROM WATER TREATMENT PLANTS--PART 2,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05F.
W71-08672

BIOLOGICAL AND CHEMICAL TREATMENT OF INDUSTRIAL WASTES,
EIMCO Corp., Salt Lake City, Utah.
D. A. Dahlstrom, L. D. Lash, and J. L. Boyd.
Chemical Engineering Progress, Vol 66, No 11, p 41-48, 1970. 6 fig, 5 tab, 6 ref.

Descriptors: *Water reuse, *Biological treatment, *Industrial wastes, Water pollution control, Sewage treatment, Waste water treatment, Solid wastes, Biochemical oxygen demand, Phosphates, Nitrogen, Suspended load, Chemical precipitation, Byproducts, Waste treatment, Chemical oxygen demand, Hydrogen ion concentration, Activated sludge, Aeration, Pilot plants, Toxicity, Effluents, Cooling towers, Solids contact process, Recirculated water, Beneficial use, Filtration, Irrigation, Dewatering, Oxygen, Economics, Colorado.
Identifiers: Colorado Springs (Colo), Recycled water.

In treating waste water, characterization of raw waste is necessary to set process conditions near optimum. A biological seed acclimated to the waste tested is necessary; nitrogen and phosphorus are essential in minimum quantities, which are conveniently added at the same time as the feed; oxygen is also required. Many chemicals such as lime, iron, and aluminum salts, as well as the newer polyelectrolytes, have shown a striking ability to coagulate finely divided colloidal solids; various natural coagulants have shown similar properties. Since biological treatment of vinyl resin wastes was inadequate to meet regulatory requirements, chemical treatment was also used. The combined biological and chemical treatments removed 97% of the biochemical oxygen demand, and suspended solids resulting in effective treatment of raw waste. Aeration equipment, solids-contact equipment, gravity clarification, dissolved air flotation, granular media filtration and sludge dewatering are calculated and described. Reuse of treated waste water to meet requirements is often economical. Two examples of water reuse and reclamation are given. By-product recoveries may represent substantial credit to the overall costs. Recovery of coal and of spent grains for animal feed or protein for human consumption in the brewery industry are examples. (Jones-Wisconsin)
W71-08674

WASTE WATER CONTROL FACILITIES IN A PETROCHEMICAL PLANT,
Union Carbide Corp., South Charleston, W. Va.; and Union Carbide Corp., Ponce, Puerto Rico.
J. E. Rucker, and R. W. Oeben.
Chemical Engineering Progress, Vol 66, No 11, p 63-66, 1970. 1 fig, 3 tab, 2 ref.

Descriptors: *Waste water treatment, *Construction costs, *Chemical wastes, Industrial plants, Water pollution control, Design criteria, Personnel, Equipment, Industrial wastes, Puerto Rico.
Identifiers: *Petrochemical wastes, Union Carbide Corporation, Ponce (Puerto Rico), Waste loads.

The Union Carbide Corporation's petrochemical plant addition at Ponce, Puerto Rico, is planned to include installation of a primary and secondary biological treatment plant for waste water from both existing and new facilities. New facilities contain equipment for recycle and product recovery. Engineering efforts to further minimize waste effluents continue through all phases of design for each production unit and operation of the new units. Aqueous pollution control represents a total investment of $12.8 million. Operating pollution control personnel, training, and design criteria are tabulated. Methods used for determining waste loads and process design of the terminal facilities, including instrumentation and control procedures, are described. Determination of total waste water load was based on flow measurement and laboratory analysis of waste streams from the existing plant plus estimates of aqueous waste loads from new units. Waste water load removal design was planned to avoid taking waste streams into the terminal treatment plant without first investigating known alternative disposal methods. The sewer system is designed to segregate storm or fire water from process waste water streams. Monitoring is provided at the treatment facilities by an operator on duty around-the-clock. (Auen-Wisconsin)
W71-08676

FEASIBILITY OF ALTERNATIVE MEANS OF COOLING FOR THERMAL POWER PLANTS NEAR LAKE MICHIGAN.
Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab.

Department of the Interior, Federal Water Quality Administration, Aug 1970. 112 p, 4 fig, 38 tab, 73 ref.

Descriptors: *Feasibility studies, *Water cooling, *Thermal powerplants, *Lake Michigan, Economic feasibility, Technical feasibility, Environmental effects, Ponds, Canals, Condensation, Cooling towers, Evaporation, Costs.
Identifiers: *Waste heat, Cooling systems.

The feasibility was evaluated of dissipating waste heat from thermal power plants located near Lake Michigan. Consideration was given to the following methods: evaporative towers with either mechanical or natural draft, cooling ponds, spray cooling canals, and dry cooling towers with either natural or mechanical draft. The study area, Lake Michigan, was subdivided into four sections to compensate for the effect of climatic conditions. The analysis of meteorological, economic, engineering, and environmental aspects indicated that any of the investigated cooling systems are feasible alternatives for power plants on Lake Michigan. The maximum economic penalty of 9-10% was for dry towers, whereas the minimum of about 1%--for cooling ponds and spray canals. (Wilde-Wisconsin)
W71-08680

METHODS FOR SEPARATION OF BDELLOVIBRIO FROM MIXED BACTERIAL POPULATION BY FILTRATION THROUGH MILLIPORE FILTERS OR BY GRADIENT DIFFERENTIAL CENTRIFUGATION,
Hebrew Univ., Jerusalem (Israel). Dept. o
Microbiological Chemistry.
For primary bibliographic entry see Field 05A.
W71-08729

STUDY OF THE FILTER ACTIVITY OF CERTAIN MARINE ANIMALS (SALPA, CIONA, AMPHIOXUS) WITH RESPECT TO LABELLED BACTERIA, COMPARED TO THE ACTIVITY OF CERTAIN EDIBLE MOLLUSKS, (ETUDE DE L'ACTIVITE FILTRANTE DE CERTAINS ANIMAUX MARINS (SALPA, CIONA, AMPHIOXUS) A L'EGARD DE BACTERIES MARQUEES, COMPAREE A L'ACTIVITE DE CERTAINS MOLLUSQUES COMESTIBLES (MYTILUS, TELLINA)),
Naples Univ. (Italy). Instituto di Igiena.
For primary bibliographic entry see Field 05C.
W71-08730

OIL POLLUTION DEFENSE SYSTEM.
Harding Pollution Control Corp., West Hempstea
N.Y.
For primary bibliographic entry see Field 05G.
W71-08758

BUILDING RELIABILITY OF PLANT, PEOPL AND SERVICE,
Detroit Metropolitan Water Services, Mich.
Gerald Remus.
Journal American Water Works Association, V 62, p 38-40, Jan 1970. 3 tab.

Descriptors: Reliability, Population, Water quali Water supply, Manpower, Training, *Cos Financing, Social change, Construction, Admin tration, Water pollution control, *Treatment fac ties, Water reuse, Cities, Michigan.
Identifiers: *Water utility, Metropolitan-areaw utility, Routine system expansion, Political involv ment, Revenue bonds, WWP formula, Det (Mich).

Reliable operation of a wide-area system does happen by chance. Although all problems can be foreseen, certain operational, personnel, fiscal policies can be adopted to enhance the re bility factor. This article discussed some of m major difficulties foreseen in water system devel ment. Tabulated data included water revenue lar distribution, capacity and cost of Detroit's w treatment plants, and growth of Detroit system sets and indebtedness. Total reliability - of our p ple, our systems, and our public acceptance - be accomplished for individual systems and for industry if we develop the people to do the properly, with the highest professional conduc we develop our systems with emphasis on all gineering aspects, rather than on supply alon we abandon provincialism; and if we move v rather than react against, changing social technical changes, then our leadership will be parent and public acceptance will be wholehear (Wang-Rutgers)
W71-08816

RISK EVALUATION IN SEWAGE TREATM PLANT DESIGN,
Cornell Univ., Ithaca, N.Y.
D. P. Loucks.
Journal of the Sanitary Engineering Divi Proceedings of ASCE, Vol 93, No SA1, p 2 Feb 1967. 9 fig.

escriptors: *Risks, *Evaluation, *Sewage treatent, Stochastic process, Construction costs, Efficiencies, Effluents, Basins, BOD, Benefits, Probabilities, Storage capacity, Standards, Frequency, Treatment facilities, Dissolved oxygen, Waste ater treatment, Waste assimilative capacity, ater quality.
entifiers: *Random variable, Serial correlation, oss correlation, Operating policy, Probabilistic odel.

is analysis was an application of some probabilitheory and computer programming to determine e design and operating criteria of a minimumst waste water treatment facility that meets a obabilistic or deterministic stream quality standrd. A probabilistic model was developed and lved to determine the cumulative probability disbutions of minimum DO concentrations for varis consecutive-day periods downstream from any rticular waste water treatment plant. The probaistic model was discussed. An outline of the comter flow diagram used for the solution of the odel was presented. An example was shown and e results of this example were discussed. If an efiency was specified for a particular plant, ether optimally or not, the model could be used predict the risks of standard violation and to termine the effectiveness of effluent storage in ducing this risk as well as the cost of waste water atment. (Wang-Rutgers)
71-08819

EVELOPING RURAL HOME WATER SUPIES,
bert A. Cannella.
urnal of Soil and Water Conservation, Vol 26, o 1, p 30-31, Jan - Feb 1971. 2 figures, 1 table.

escriptors: *Water quality control, *Cost comrisons, Initial costs, *Treatment facilities, Rural eas.
entifiers: *Putnam County Soil Conservation Dist.

e author describes the economic and construcn details of building a surface water supply for an lividual in a rural area. The author explains that areas where groundwater is highly contaminated chemicals the cost of this system compares vorably with other types of rural water supply. e filtration system that he describes is a smalle replica of a municipal treatment facility with initial cost of approximately $1500. (Holmes - tgers)
71-08823

CTORS INFLUENCING PHOSPHORUS EMOVAL BY BIOLOGICAL TREATMENT,
nitary Engineering Center, Cincinnati, Ohio.
bert L. Bunch.
emical Engineering Symposium Series, Water - 70, Vol 67, No 107, p 90-94. 3 tab, 33 ref.

escriptors: *Nutrients, *Phosphorus, Anaerobic gestion, Sewage effluents, Eutrophication, iological treatment, Waste water treatment, osphates, Nutrient requirements.

nventional biological treatment, as practiced day, does not effectively remove nutrients from ste water. The influence of increased use of osphates, digester recycle, and imbalance of trients in waste water is discussed. Phosphorus moval by synthesis can be higher than normally countered if digester supernatant is not recycled d primary clarification is eliminated. The mination of these two practices will increase the rbon to phosphorus ratio, thereby tending to cort the nutrient imbalance. (Bunch-EPA)
71-08827

OMBINED BIOLOGICAL AND CHEMICAL EATMENT FOR PHOSPHORUS REMOVAL,
dvanced Waste Treatment Research Program, ncinnati, Ohio.
chael C. Mulbarger, and Donald G. Shifflett.
Chemical Engineering Progress Symposium Series, Vol 67, No 107, p 107-116, 1970. 13 fig, 3 tab, 19 ref. FWQA Contract WA66-19.

Descriptors: Waste water treatment, *Activated sludge, *Chemical precipitation, *Phosphorus, *Aluminum, Biological treatment, Sludge.
Identifiers: *Alum, *Aluminate, Suspended solid.

Liquid alum and sodium aluminate were utilized for phosphorus removal at 1.0 and 0.2 million gal/day activated sludge municipal waste water treatment plants. Phosphorus removals were determined at aluminum to phosphorus ratios up to a limiting point which exhibited a minimum total soluble phosphorus residual of about 1.0 mg/liter. More efficient use of chemical and higher phosphorus removal efficiencies are obtained in a multistage activated sludge system. The type of activated sludge system also influenced chemical phosphorus removals. Excessive effluent suspended solids were found to be more a function of the volatile solids produced to aluminum added ratio than of exceeding a given aluminum to phosphorus ratio or aluminum dosage. The added chemical serves as a weighting agent in the activated sludge and fully compensates for the additional solids mass to be handled both in terms of system hydraulics and solids handling. Batch studies indicate that aluminum as alum will outperform iron as ferric chloride on a performance/cost basis and that the best point of addition is just before solids-liquid separation. The considerations involved in this type of phosphorus removal system are discussed. (Mulbarger-EPA)
W71-08828

CASE STUDIES OF MUNICIPAL WASTE DISPOSAL SYSTEMS,
Bureau of Mines, Pittsburgh, Pa. Eastern Field Operation Center.
For primary bibliographic entry see Field 05E.
W71-08907

5E. Ultimate Disposal of Wastes

DISPOSAL OF WASTES FROM WATER TREATMENT PLANTS--PART 2,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05F.
W71-08672

OCEAN POLLUTION AND MARINE WASTE DISPOSAL.
For primary bibliographic entry see Field 05B.
W71-08761

SUMMARY OF FINDINGS ON SOLID WASTE DISPOSAL SITES IN NORTHEASTERN ILLINOIS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 05G.
W71-08901

CASE STUDIES OF MUNICIPAL WASTE DISPOSAL SYSTEMS,
Bureau of Mines, Pittsburgh, Pa. Eastern Field Operation Center.
H. W. Sheffer, E. C. Baker, and G. C. Evans.
Bureau of Mines Information Circular 8498, 1971. 36 p, 14 fig, 19 ref.

Descriptors: *Waste disposal, *Municipal wastes, *Waste treatment, *United States, *Reviews, Methodology, Sanitary engineering, Landfills, Hydrology, Water pollution, Path of pollutants, Mine wastes, Geology, Groundwater, Water quality, Compaction, Compressibility, Solid wastes, Incineration, Percolation, Seepage.
Identifiers: *Landfill hydrology.

Technical and economic aspects of community refuse disposal systems and their effects on the environment are identified and described. Seven landfills and two incineration systems, located throughout the United States, are reviewed. For example, a solid wastes landfill stabilization project conducted for the city of Santa Clara, Calif., proved that aeration of sanitary landfills provides more rapid stabilization, greater refuse density following compaction, the conservation of landfill space, and elimination of vermin and bacteria by high-temperature oxidation. (Woodard-USGS)
W71-08907

5F. Water Treatment and Quality Alteration

MARINE FOULING IN POWER STATIONS,
Central Electricity Generating Board, Southampton (England). Marine Biological Lab.
For primary bibliographic entry see Field 05D.
W71-08598

MUSSEL FOULING IN CHLORINATED COOLING SYSTEMS,
Central Electricity Generating Board, Southampton (England). Marine Biological Lab.
For primary bibliographic entry see Field 05D.
W71-08599

DISPOSAL OF WASTES FROM WATER TREATMENT PLANTS--PART 2,
American Water Works Association Research Foundation, New York.
Harry A. Faber, and Kitty C. Klomp.
Journal American Water Works Association, Vol 61, No 11, p 619-638, 1969.

Descriptors: *Waste water treatment, *Waste disposal, *Water works, *Water treatment, Water softening, Chemical precipitation, Sludge, Dialysis, Coagulation, Freezing, Centrifugation, Brine disposal, Cation exchange, Separation techniques, Water pollution, Ultimate disposal, Costs, Sludge disposal, Sludge treatment, Legislation.
Identifiers: Alum sludge, Sanitary sewers, Vacuum filtration, Sand bed, Wedge wire drying, Filter pressing, Softening sludge, Reclaiming lime, Wash-water wastes.

Current information on and improved techniques to solve the problems of water treatment plant waste disposal and regulatory aspects are given. Since alum is prime coagulant in U S water plants, disposal of sludge is of primary consideration. Discharge of water treatment plant wastes directly to surface waters is impractical. Among various methods of water treatment waste disposal discussed are lagoons, discharge to sanitary sewers, a freezing process (operated in the United Kingdom), the advantages of the centrifuge method, vacuum filtration, sand drying beds, treatment by filter pressing, larging to seas, pipeline transport, and cost of alum recovery. Disposal of filter wash-water, disposal of sludge from softening plants, including lagoon treatment, sewer discharge, and lime reclamation, together with disposal of brines are also deliberated, together with the status of plant operation and regulatory aspects. (Jones-Wisconsin)
W71-08672

PROBABILITY THEORY AS AN AID TO RESEARCH PLANNING,
Wisconsin Univ., Madison. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W71-08682

BACTERIOLYTIC STOCK IN SEAWATER, (SOURCES BACTERIOLYTIQUES DANS L'EAU DE MER),
Naples Univ. (Italy). Instituto di Igiena.
E. Campanile, V. Ferro, E. DeSimone, S. Grasso, and R. DeFusco.

Revue International d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Fondation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 117-124.

Descriptors: Water pollution control, *Self-purification, *Bacteria, Sea water, Water treatment, Micro-organisms.
Identifiers: *Lytic strains, *Bdellovibrio bacteriovorus.

Bacteriological research on Bdellovibrio bacteriovorus in sea water indicated, with some frequency and constancy, the presence of colonies which can bring on the lysis of some test bacteria. This phenomenon and its possible intervention in self-purification led to further studies on the nature of lytic strains and their capabilities in self-purification. Research of lytic strains is much easier when the culture medium is low in nutrients. Temperature, nature and way of innoculation of test-bacteria influence the test value. The time parameter is variable from one strain to another and is also variable within each individual strain. Isolated lytic strains showed a certain preference for gram-positive terrestrial germs, however, some act against both gram-negative and gram-positive bacteria. (Ensign-PAI)
W71-08732

RESEARCH OF THE BDELLOVIBRIO BACTERIOVORUS IN THE SEA, RIVERS AND SEWAGE WATERS, RECHERCHE DU BDELLOVIBRIO BACTERIOVORUS DANS LA MER, LES FLEUVES ET LES EAUX D'EGOUT,
Naples Univ. (Italy). Istituto di Igiena.
V. Ferro, E. DeSimone, E. Campanile, R. DeFusco, and S. Grasso.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Foundation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 109-115.

Descriptors: *Self-purification, *Bacteria, Water pollution control, Seawater, Fresh water, Sewage, Pathenogic bacteria, Water treatment.
Identifiers: *Bdellovibrio bacteriovorus, *Salmonella typhi, *Pseudomonas aeruginosa.

The role of Bdellovibrio bacteriovorus in the process of self purification in sea water, fresh water and sewage water was studied. Test-germs used were Salmonella typhi (Vi strain) and Pseudomonas aeruginosa. B. bacteriovorus was found to be more frequent after samples were enriched with the host bacteria and was more abundant in sewage than fresh water and least abundant in sea water. Lytic action of B. bacteriovorus in relation to P. aeruginosa is discussed. Epidemiological aspects in studying the action of B. bacteriovorus on certain gram negative germs, pathogens towards man, are considered. (Ensign-PAI)
W71-08733

VIABILITY OF ENTAMOEBA HISTOLYTICA CYSTS EXPOSED TO SEA WATER,
Technion - Israel Inst. of Tech., Haifa (Israel). Sanitary Engineering Labs.
For primary bibliographic entry see Field 05B.
W71-08735

DISTRIBUTION OF SOME PARASITIC GERMS AND PATHOGENIC BACTERIA IN WORLD-WIDE WATERS, (DISTRIBUTION DES GERMES PARASITES DES BACTERIES PATHOGENES DANS LES EAUX MONDIALES),
Institut Pasteur, Paris (France); Murmanskaya Biologicheskaya Stantsiya (USSR); and Akademiya Nauk SSSR, Leningrad. Zoologicheskii Institut.
For primary bibliographic entry see Field 05B.
W71-08736

BIOLOGICAL FACTORS OF SELF-PURIFICATION OF SEA WATER: CLEAR AND OBSCURE POINTS OF A DEBATABLE QUESTION, (FACTEURS BIOLOGIQUES D'AUTOEPURATION DES EAUX DE MER: POINTS CLAIRS ET POINTS OBSCURS D'UNE QUESTION DISCUTEE),
Naples Univ. (Italy). Istituto di Igiena.
For primary bibliographic entry see Field 05G.
W71-08738

5G. Water Quality Control

PIPELINE FLOW OF SOLIDS-LIQUID SUSPENSIONS,
Syracuse Univ., N. Y.
For primary bibliographic entry see Field 05D.
W71-08397

FIRST NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES PROCEEDINGS.
For primary bibliographic entry see Field 05D.
W71-08398

WURDD'S TASK FORCE ON AGRICULTURAL POLLUTION,
Agricultural Research Service, Albany, Calif. Western Utilization Research and Development Div.
For primary bibliographic entry see Field 05D.
W71-08415

GUIDELINES--WATER QUALITY MANAGEMENT PLANNING.
Environmental Protection Agency, Washington, D.C. Water Quality Office.
For primary bibliographic entry see Field 06E.
W71-08427

WATER QUALITY CONTROL IN CALIFORNIA: A REGIONAL APPROACH,
For primary bibliographic entry see Field 06E.
W71-08428

A BILL TO AMEND THE CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FOR STANDARDS FOR THE MANUFACTURE OF CERTAIN PRODUCTS TO PROTECT THE QUALITY OF THE NATION'S AIR AND NAVIGABLE WATERS.
For primary bibliographic entry see Field 06E.
W71-08429

FIRST ANNUAL REPORT ON THE STATE OF THE NATION'S ENVIRONMENT--MESSAGE FROM THE PRESIDENT OF THE UNITED STATES,
For primary bibliographic entry see Field 06E.
W71-08431

SANTA BARBARA CHANNEL OIL LEASES,
For primary bibliographic entry see Field 06E.
W71-08437

THE FLORIDA WATER POLLUTION CONTROL AND SEWAGE TREATMENT PLANT GRANT ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-08441

PUBLIC HEALTH ASPECTS OF INDIVIDUAL WATER WELLS,
Monroe County Health Dept., Mich.
J. C. Hancock.
Groundwater, Vol 1, No 3, p 27-29, July 1963. 1 tab, 4 ref.

Descriptors: *Water wells, Water quality, *Michigan, *Public health, *Standards, Water pollution control.
Identifiers: Water well construction code, Shigella infections, Shallow wells.

Local government in Michigan, and perhaps in other states, must try to bring the best thinking there is concerning solutions to health problems which are within their legally designated area of responsibility. One such local health department activity in Michigan is the construction and operation of private individual water well systems. Monroe County, which is just beginning to feel the effects of the suburban spillover from Detroit Michigan, and Toledo, Ohio, recognized, in 1961 the need for regulation of such water well systems. The subsequent development of a Code, and its enforcement have made us realize that we are just beginning to fully understand a subject which is much broader in scope from a public health standpoint than just construction details and bacteria tests. (Campbell-NWWA)
W71-08470

HYDRODYNAMICS AND DISCHARGE MEASUREMENTS OF STORM SEWERS,
Rutgers - The State Univ., New Brunswick, N. Water Resources Research Inst.
For primary bibliographic entry see Field 08B.
W71-08496

LAKE AND RIVER POLLUTION, AN ANNOTATED BIBLIOGRAPHY,
For primary bibliographic entry see Field 05B.
W71-08498

WATER QUALITY MANAGEMENT AND POLICY MODEL,
Clemson Univ., S. C. Dept. of Environment Systems Engineering; and Georgia Inst. of Tech Atlanta. School of Industrial and Systems Engineering.
William W. Hines, and Benjamin C. Dysart, III.
AIIE Transactions, Vol III, No 1, p 7-12, Mar 197 6 p, 4 fig, 26 ref. OWRR Project A-012-GA (4) a A-023-GA (2).

Descriptors: *Dynamic programming, *Wa quality control, *Optimization, *Costs, *Waterp icy, *Organic wastes, *Temperature, Dissolved oxygen, River basins, Biochemical oxygen dema Resource allocation.

Interrelated quality characteristics for a river ba were considered in the formulation of a dynam programming model to minimize total cooling a treatment costs. The specific water quality param ters selected for study were dissolved oxygen a temperature which were affected principally by ganic and thermal wastes, respectively. A sketch a generalized river basin was shown and th shown again as a series of discrete reaches. It necessary to consider three system boundaries: the upstream limit of the system, (b) downstream limit of the system, and (c) boundar of individual reaches between (a) and (b). problem was formulated as a resource allocat problem where the resource being allocated the natural capacity of a stream to assimilate th mal and organic waste and then as an initial-va dynamic programming problem. Temperatu temperature rise, and dissolved oxygen were c strained at each stage. The cost functions for b cooling and treatment were well behaved, and c straints were such that the feasible regions w reduced significantly. It was noted that this mo should be useful in evaluating the effects of the cation of another waste source on a river. (K Cornell)
W71-08499

FLORIDA AQUATIC WEED CONTROL ACT
For primary bibliographic entry see Field 06E.
W71-08502

LE OF MICROORGANISMS GROWING ON L IN THE SELF-CLEANING AND INDICA-ON OF OIL POLLUTION IN THE SEA,
r primary bibliographic entry see Field 05A.
1-08503

UDIES OF OIL RETENTION BOOM DRODYNAMICS,
dronautics, Inc., Laurel, Md.
lliam T. Lindenmuth, E. R. Miller, Jr., and C. C.
.
ilable from the National Technical Information vice as AD-719294, $3.00 in paper copy, $0.95 nicrofiche. Coast guard Contract DOT-CG-00-A.

criptors: *Water pollution, *Oil wastes, Shear
.
ntifiers: Containment, *Hydrodynamics, Mode s, Oil spills, Oil booms.

ults of an experimental investigation of oil con-ment hydrodynamics are presented with oretical analyses to help explain the experimen-indings. Two-dimensional model tests were per-ned using several petroleum products including el fuel and motor oil. Test variables in addition il properties were current, interfacial tension, vity waves, slick volume, containment boom metry, and boom depth. Also studied were e-dimensional effects and the effficiency of g absorbent additives and multiple boom con-rations as containment aids.
1-08511

COVERY OF MICA FROM SILT DEPOSITS THE NOLICHUCKY RESERVOIR, TENNES-,
eau of Mines, Tuscaloosa, Ala. Tuscaloosa allurgy Research Center.
primary bibliographic entry see Field 05D.
1-08523

ONSIDERATION OF FEDERAL FINANCIAL ENTIVES TO INDUSTRY FOR ABATING TER POLLUTION.
gue of Women Voters, Washington, D.C.

rent Review of Water Resources, No 3, League Vomen Voters of the US, Washington, DC, Aug 6. 20 p, 9 ref.

criptors: *Water pollution control, *Industrial es, *Pollution abatement, *Taxes, Financing, eral project policy, Industrial plants, Pollutants, eral government, Feasibility studies, Water ity, Water quality control, Tax rate, Economic ibility, Waste disposal, Waste treatment, Ef-nts, Treatment facilities, Water pollution ces, Water pollution treatment, Legal aspects, inistration.
tifiers: *Economic incentives.

ng the recent intensification of interest in in-rial water-pollution abatement, this publication siders alternative federal programs to provide stry with financial incentives to abate water ution. The article examines: (1) financial in-ives proposed in Congress, (2) tax preferences ing to marginal companies, (3) reasons sup-ing tax preferences, (4) opposition to tax erences, (5) alternatives to tax preferences, (6) questions for citizens to consider. The uation focuses primarily upon external, 'carrot-' tax incentives. The merits and relative impact ccelerated depreciation methods and invest-t tax credits are considered. Six arguments sup-ng tax incentives are presented, and ten argu-ts in opposition are listed. User charges, cting the burden imposed on the community, effluent charges, covering all damages result-rom industrial wastes, are evaluated as 'stick-' alternatives to tax preferences. In conclusion, ries of nine questions as to who will pay for in-rial water-pollution abatement are presented, g with a list of nine informational publications ilable to laymen. (Earl-Florida)
-08529

SYMPOSIUM ON MULTIPLE-SOURCE URBAN DIFFUSION MODELS.
For primary bibliographic entry see Field 05B.
W71-08533

GROUNDWATERS OF MAGNESITE KARST IN CZECHOSLOVAKIA (GERMAN: UNTERIRDISCHE WASSER DES MAGNESITKARSTES IN DER CSSR),
For primary bibliographic entry see Field 02F.
W71-08576

A BILL TO AMEND THE OIL POLLUTION ACT TO IMPLEMENT THE PROVISIONS OF THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF THE POLLUTION OF THE SEA BY OIL.
For primary bibliographic entry see Field 06E.
W71-08578

ACID MINE DRAINAGE FORMATION AND ABATEMENT.
Ohio State Univ., Research Foundation, Columbus, Ohio.

Available from the National Technical Information Service as PB-199 835, $3.00 in paper copy, $0.95 in microfiche. Water Pollution Control Research Series, DAST-42, Apr 1971. 82 p, 7 fig, 69 ref. EPA Program 14010 FPR-04/71.

Descriptors: *Acid mine water, *Pyrite, *Oxidation, *Pollution abatement, Ferrobacillus, Underground streams, Mine wastes, Water pollution control, *Mine drainage, Mining, Iron bacteria, Chemical reactions, Kinetics.

This report pertains to at-source control of pyrite oxidation. The current level of knowledge of acid mine drainage formation is critically reviewed, with emphasis on reaction kinetics and reactant and product transport. A reaction system model is developed which provides a conceptual framework for subsequent discussion dealing specifically with the physical, chemical, and biological characteristics of pyritic systems encountered in mining situations. Practical considerations of at-source control of acid mine drainage formation in underground mines, spoil banks, and refuse piles are presented in the final section. Deficiencies in current knowledge include: Descriptions of the physical environment existing at pyrite oxidation sites in natural systems are far more incomplete that the current understanding of pyrite oxidation kinetics; oxygen transport is poorly described at this time, but is probably the rate-controlling factor in most instances; serious questions exist as to the effectiveness of air-sealing techniques as currently practiced; the significance of bacterial catalysis of pyrite oxidation under field conditions has not been established.
W71-08591

EFFECTS OF ARTIFICIAL DESTRATIFICATION ON DISTRIBUTION OF BOTTOM ORGANISMS IN EL CAPITAN RESERVOIR,
California State Dept. of Fish and Game, Sacramento. Inland Fisheries Branch.
Alex Calhoun, Paul Hubbell, and Arlow Fast.
California Department of Fish and Game, Fish Bulletin 148, 1970. 30 p, 17 fig, 5 tab, 24 ref.

Descriptors: *Aquatic habitats, *Biomes, *Ecological distribution, *Stratification, *Dissolved oxygen, *Hypolimnion, *Limiting factors, Ecology, Environmental gradient, Distribution patterns, Food webs, Dominant organisms, Niches, Thermal stratification, Epilimnion, Reservoirs, Spatial distribution, Benthic fauna, Clams, Oligochaetes, Diptera, Nematodes, Invertebrates, California.
Identifiers: *Artificial enhancement, Enhancement, Destratification, Midge larvae, El Captian Reservoir.

The bottom fauna of El Capitan Reservoir, San Diego County, California, was sampled during 1964, under normal conditions, which included prolonged stratification. The lake was then destratified artificially by injection of compressed air for two years. The benthic organisms rapidly invaded the profundal zone, in which they had previously been absent. Their total numbers in the lake increased dramatically. A combination of anoxia and toxicity in the hypolimnion had presumably excluded them from the deeper parts of the lake when it was stratified. In 1967 the lake was permitted to stratify again. By August the normal summer distributional pattern of bottom organisms was beginning to re-appear. Extending the distribution of midges throughout the lake by artificial destratification should increase the amount of flood available to game fish. The long term implications of artificial destratification for reservoir fishery management are discussed. (LeGore-Washington)
W71-08611

ENVIRONMENTAL PROTECTION--TVA EXPERIENCE,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 06G.
W71-08640

RESULTS OF FIELD INVESTIGATIONS OF VELOCITIES OF WATER MOVEMENT IN COOLING RESERVOIRS,
For primary bibliographic entry see Field 08B.
W71-08641

GROUND WATER SAFETY EVALUATION - PROJECT GASBUGGY,
Teledyne Isotopes, Polo Alto, Calif. Palo Alto Labs.
Daniel Sokol.
Available from NTIS PNE-1009. PNE-1009, Mar 12, 1971. 38 p, 5 fig, 10 tab, 13 ref. AEC Contract AT (29-2)-1229.

Descriptors: *Groundwater movement, *Permeability, *Sandstones, *Radioisotopes, Nuclear explosions, Excavation, Natural gas, Soil contamination, Water pollution, Strontium radioisotopes, Tritium.
Identifiers: Cesium radioisotopes.

Groundwater in the Ojo Alamo Sandstone could mix with other water along the San Juan River near the mouth of Los Pinos River, 38 kilometers northwest of the Gasbuggy site. However, based on available data, it will take 5900 years for the groundwater at the Gasbuggy site to flow to this point. Within 309 years tritium will decay below the appripriate concentration guide (CG) for the general public. Strontium-90 and cesium-127 will migrate no farther from the cavity than 320 meters and 3.5 meters, respectively, in 1000 years, and by this time both nuclides will have decayed to well below the CG. (Bopp-ORNL)
W71-08652

DETERMINATION OF THE FEASIBILITY OF REMOVAL OF ALGAL NUTRIENTS IN LAKE WATER BY ION EXCHANGE,
Massachusetts Univ., Amherst. Water Resources Research.
O. T. Zajicek.
Available from the National Technical Information Service as PB-199 914, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Publication No 12 (undated). 64 p, 13 fig, 14 tab, 45 ref. OWRR Project A-018-MASS (2).

Descriptors: *Eutrophication, *Ion exchange, *Phosphorus, *Theoretical analysis, *Anion exchange, Chlorides, Sulfates, Separation techniques, Lakes, Nutrients, Reservoirs, Resins, Phosphates, Fresh water.
Identifiers: Phosphate removal, Valency.

Excessive amounts of phosphorus, introduced by the activities of man, contribute to the accelerated

eutrophication experienced in many of our natural waters. The feasibility was studied of using ion exchange techniques, perhaps in a new way, to effect a reduction in the phosphorus levels of natural waters. A study of the ion exchange characteristics of phosphate species in the presence of chloride as a competing ion was completed. A similar study using sulfate as the competing ion is nearing completion at the present time and is briefly discussed. Over the pH range of natural waters, the phosphate species undergoing exchange is HPO sub 4 2-. With chloride as the competing ion the electroselectivity principle applies; with sulfate a similar phenomenon occurs due to the base strength of the HPO sub 4 2- ion. Kinetic studies of the exchange process indicate that it is the HPO sub 4 2- ion concentration which is rate controlling and this ion migrates through the resin-solution interface. Ion exchange removal of phosphate from natural waters is feasible and should be investigated further with field studies. (Wilde-Wisconsin)
W71-08669

WARM WATER UTILIZATION,
Oregon State Univ., Corvallis. Dept. of Soils.
For primary bibliographic entry see Field 03C.
W71-08671

HILL V CITY OF WINTERSET (DAMAGES FOR CITY'S MAINTENANCE OF NUISANCE).
For primary bibliographic entry see Field 06E.
W71-08678

CONTINUOUS SYSTEM MODELS OF OXYGEN DEPLETION IN A EUTROPHIC RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Chemistry.
For primary bibliographic entry see Field 06A.
W71-08684

STOVERN V TOWN OF CALMAR (MEASURE OF WATER POLLUTION DAMAGES TO LESSOR OF RIPARIAN LAND).
For primary bibliographic entry see Field 06E.
W71-08689

STOVERN V TOWN OF CALMAR (ABATEMENT OF WATER POLLUTION NUISANCE THROUGH CONSTRUCTION OF SEWAGE DISPOSAL SYSTEM).
For primary bibliographic entry see Field 06E.
W71-08692

NATURAL RESOURCES: CONSERVATION AND MANAGEMENT.
Department of Defense, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-08695

STATE TAX INCENTIVES TO FIGHT POLLUTION,
For primary bibliographic entry see Field 06E.
W71-08696

CONTINENTAL SHELF OIL DISASTERS: CHALLENGE TO INTERNATIONAL POLLUTION CONTROL,
For primary bibliographic entry see Field 06E.
W71-08697

FOREWORD TO SYMPOSIUM--LAW AND THE ENVIRONMENT,
For primary bibliographic entry see Field 06E.
W71-08698

LEGISLATION AND THE ENVIRONMENT: INDIVIDUAL RIGHTS AND GOVERNMENT ACCOUNTABILITY,
For primary bibliographic entry see Field 06E.
W71-08699

THE RIGHT TO A DECENT ENVIRONMENT: E—MC2: ENVIRONMENT EQUALS MAN TIMES COURTS REDOUBLING THEIR EFFORTS,
For primary bibliographic entry see Field 06E.
W71-08700

THE WILD AND SCENIC RIVERS ACT OF 1968,
For primary bibliographic entry see Field 06E.
W71-08701

AGRICULTURE: THE UNSEEN FOE IN THE WAR ON POLLUTION,
For primary bibliographic entry see Field 06E.
W71-08702

ENVIRONMENTAL CONTROL: HIGHER STATE STANDARDS AND THE QUESTION OF PREEMPTION,
For primary bibliographic entry see Field 06E.
W71-08704

WATER POLLUTION CONTROL IN VERMONT: A SYSTEM OF EFFLUENT CHARGES,
For primary bibliographic entry see Field 06E.
W71-08705

SAVING BYRON'S SEA: FEDERAL AND STATE REGULATION OF OIL POLLUTION FROM OCEAN PETROLEUM PRODUCTION,
For primary bibliographic entry see Field 06E.
W71-08706

OIL POLLUTION REGULATIONS.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-08709

POLLUTION OF THE GREAT LAKES AND SOLID WASTE DISPOSAL AT SEA.
For primary bibliographic entry see Field 06E.
W71-08711

LIABILITY FOR OIL POLLUTION CLEANUP--NON-SELF-PROPELLED BARGES EXEMPTED UNDER CERTAIN CIRCUMSTANCES.
For primary bibliographic entry see Field 06E.
W71-08712

CHIPLEY V BEELER (LIABILITY FOR ALTERING FLOW OF SURFACE WATER).
For primary bibliographic entry see Field 06E.
W71-08717

STEPPED-UP WAR ON POLLUTION.
For primary bibliographic entry see Field 06E.
W71-08720

MORTALITY OF COLIFORM BACTERIA IN SEA WATER SAMPLES IN THE DARK,
Water Pollution Research Lab., Sevenage. (England).
E. B. Pike, A. L. H. Gameson, and D. J. Gould.
Revue Internationale d'Oceanographie Medicale, Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Institut National de la Sante et de la Recherche Medicale, Fondation de la Ville de Nice, Nice, Vols 18 and 19, 1970, p 97-107. 8 ref.

Descriptors: *Sewage, *Bacteria, *Coliforms, *E. Coli, *Mortality, Sea water, Temperature, Salinity, Water pollution control.

The mortality of sewage coliform bacteria and the factors influencing the rate of mortality along with Escherichia coli were studied in over 400 laboratory experiments. Coliform bacteria mortality in seawater, estuaries and rivers with domestic sewag present followed a first order kinetic pattern wit the rate increasing with increase in temperatur and salinity. The mortality rate of indigenou coliform bacteria in seawater was apparently nc related to season or to amount of daylight. (Ensig PAI)
W71-08734

BIOLOGICAL FACTORS OF SELF-PURIFICA TION OF SEA WATER: CLEAR AND OBSCUR POINTS OF A DEBATABLE QUESTION, (FAC TEURS BIOLOGIQUES D'AUTOEPURATIO DES EAUX DE MER: POINTS CLAIRS E POINTS OBSCURS D'UNE QUESTION DISCU TEE),
Naples Univ. (Italy). Istituto di Igiena.
A. Paoletti.
Revue Internationale d'Oceanographic Medica Centre d'Etudes et de Recherches de Biologie d'Oceanographic Medicale, Institut National de Sante et de la Recherche Medicale, Foundation la Ville de Nice, Nice, Vols 18 and 19, 1970, p 3 68. 312 ref.

Descriptors: *Self-purification, *Bacteria, *A tibiotics, Sea water, Water purification, Water p lution control.
Identifiers: *Bdellovibrio bacteriovorus, Fil feeders, Lytic factors.

Self-purifying biological factors in sea-wa rivers, lakes, sewage treatment plants and soil reviewed. These factors include bactericidic a antibiotic activity, bacteriophages, and Bd lovibrio bacteriovorus. Strong purifying acti was shown by filter-feeders. The presence of b teriolytic moulds and bacteria indicated lytic f tors to be of importance in self purificat processes. (Ensign-PAI)
W71-08738

THE FEASIBILITY OF OIL COLLECTI DEVICES,
Charles River Association, Wayland, Mass.
D. P. Hoult, R. H. Cross, III, and J. H. Milgran.
Available from the National Technical Informa Service as AD-716 325, $3.00 in paper copy, $0 in microfiche. Final Report, US Coast Guard C tract Number Dot-CG-02, 346-A, June 24, 19 36 p, 8 fig, 2 tab, 4 ref. US Coast Guard Project 704103/004.

Descriptors: Oil, *Skimming, *Diversion, *F control, Numerical analysis, Water pollution trol, *Oil wastes, Oily water.
Identifiers: Surface skimmers, Laboratory mo Oil slicks.

Theoretical and experimental investigations o flow of a thin oil film into a large, converging-c nel surface skimmer were conducted. Three ferent flow regimes are described. Potentiali large-scale skimmer devices, based on small-s laboratory models and numerical analysis are sidered. Configurations for the various regions skimmer and a design exercise based on a recovery rate of 200 tons per hour were develo (Ensign-PAI)
W71-08747

INVESTIGATION OF THE USE OF A BOR FLOW TO SEPARATE OIL FROM AN WATER MIXTURE,
United Aircraft Corp., East Hartford, C Research Labs.
Arthur E. Mensing, Richard C. Stoeffler, Willi R. Davison, and Thomas E. Hoover.
Available from the National Technical Inform Service as AD-716 309, $3.00 in paper copy, $ in microfiche. Final Report, US Coast Guard tract DOT-CG-00546-A, Nov 1970. 90 p. 40 ref. US Coast Guard Report No 714103/A/00

Descriptors: *Oil wastes, *Oil-water inter *Separation techniques, *Flow rates, *Vo

eaning, Model studies, Design, Equipment, Ap-
ation methods, Water pollution control, Oily
er.

ortex separator as a component of an oil spill
n-up system was evaluated. This apparatus con-
ously separates the oil from an oil-water mix-
with individual outlets for the oil and water.
xperimental investigation of a laboratory-scale
el vortex separator, to determine its adequacy
various geometric and flow conditions, and an
uation of a full-scale vortex separator including
pumps and prime movers was conducted.
eria are given for design of full-scale vortex
rator based on average residence time. Sizes,
hts, and costs of separators, pumps and motors
volume flow rates between 1000 and 100,000
were determined. (Ensign-PAI)
-08749

**DEGRADATION OF OIL SLICKS IN THE
RINE ENVIRONMENT,**
gers - The State Univ., New Brunswick, N.J.
ard Bartha.
ilable from the National Technical Information
ice as AD-715 801, $3.00 in paper copy, $0.95
icrofiche. Office of Naval Research Technical
ort No 1, Dec 1970. 10 p, 6 ref. NOOO 14-67-
15-0005 Task No NR 137-843.

criptors: *Oil wastes, *Biodegradation,
croorganisms, *Chromatography, *Separation
niques, Water pollution control.
tifiers: Containment, Recovery, Hydrocar-
, Crude oil.

egraded crude oil and individual hydrocarbons
tested and standardized by liquid-liquid ex-
ion and gas chromatographic techniques.
ral methods and devices were tested for con-
ment and recovery of oil slicks in field studies.
ting frames, air-curtain devices and vertical
tubes partially submerged by a styrofoam float
described and evaluated. Forty strains of oil-
ading marine microorganisms were isolated in
culture on sea salts media with individual
ocarbons or crude oils as the added carbon
ce. The substrate range of these organisms was
sed on two types of crude oil and on eleven
atic, alicyclic and aromatic hydrocarbons.
ign-PAI)
-08750

**RINE OIL POLLUTION AND THE WATER
LITY IMPROVEMENT ACT OF 1970,**
York Univ., N.Y. School of Law.
primary bibliographic entry see Field 06E.
-08751

**TIGUOUS ZONES FOR POLLUTION CON-
L: AN APPRAISAL UNDER INTERNA-
NAL LAW,**
mi Univ., Fla.
primary bibliographic entry see Field 06E.
-08754

**JARIES -- AMERICA'S MOST VULNERA-
FRONTIERS,**
onal Wildlife Federation, Washington, D.C.
Johns.
lable from National Wildlife Federation,
ington, DC, 20036, Price $0.10. Rev ed 1969.

riptors: *Esturaries, *Conservation, *Water
tion control, *Water management, Estuarine
onment, Adoption of practices, National
rces, Water pollution abatement, Water pol-

ifiers: Massachusetts Squaw's Hole Case,
basin studies, Florida conservation programs,
ands exploitation.

stuary is a border between land and sea.
rine waters are the life-line of the sea, com-
prising a great natural resource. They have the one common characteristic, change. While little is ever lost in dynamic, natural change, great concern should be shown for the permanent change which man is causing in estuaries. A history is given of a century of wetlands exploitation, with new threats from pesticide and oil pollution. The first great need in combating estuary deterioration is research, so that the value of estuaries can be realized. The Massachusetts 'Squaw's Hole Case,' 426 river basin studies, and Florida conservation programs are presented as examples of efforts to protect and save marshes and estuaries. Above all else, remaining estuarine areas must be left in their natural condition. (McEntyre-PAI)
W71-08755

CONVENTION ON OIL POLLUTION AMENDED,
Shell International Marine Ltd., London (England).
M. P. Holdsworth.
Marine Pollution Bulletin, Vol 1 (NS), No 11, p 168-69, Nov 1970.

Descriptors: *Oil wastes, *Water pollution control, *Oil industry, *Legislation, Ships, Regulation, Control systems, Monitoring.
Identifiers: *IMCO, *Amendments, International Convention on Oil Pollution.

Amendments proposed to the Convention at the IMCO Assembly in October, 1969, are analyzed with respect to oil pollution control. Present provisions have not been effective for the following reasons: the limitation of effluent oil content by volume ratio is not necessarily relevant; enforcement has been impossible; and the 100 miles no-discharge zone is little protection against the waxy tank washing residues. The new amendments provide total prohibition of tank washing residue dumping, permits a tanker more than 50 miles offshore to discharge oil effluent if the oil instantaneous rate doesn't exceed 60 l. per mile of ship travel, and enables enforcement whereby a tanker which has cleaned on passage must arrive with full complement of residues. Additional new rules are discussed, including reasons for the deletion of existing Article III (c) which prohibited oil discharge from new tankers in excess of 20,000 gross tons. (McEntyre-PAI)
W71-08756

CRITICAL VIEW OF 1969 AMENDMENTS,
Nordic Union on Oil Pollution, Stockholm (Sweden).
G. Boos.
Marine Pollution Bulletin, Vol 1 (NS), No 11, p 169-170, Nov 1970.

Descriptors: *Oil wastes, *Legislation, *Water pollution control, *Oil industry, Ships, Control systems, Monitoring, Regulation.
Identifiers: *IMCO, *Amendments, *Critical review, International Convention on Oil Pollution.

1961 Amendments adopted by the sixth IMCO Assembly restrict oil discharge from ships considerable more than previously. The impact for oil tankers is that the load-on-top system will be compulsory whereby oil discharge into the sea from tank washings and the ballast water is avoided. A small discharge will still be allowed on the way to the loading port not nearer than 50 miles to land and only with certain precautions. Drawbacks of the various amendments are examined, showing that there will still be permitted a large amount of oil discharge and of such nature that it will persist until it reaches shore. A serious retrogression is the abandonment of the present requirement of total oil discharge prohibition for new ships of 20,000 tons gross or more. The ultimate goal of total oil discharge prohibition has once again been put off for a future time. (McEntyre-PAI)
W71-08757

OIL POLLUTION DEFENSE SYSTEM.
Harding Pollution Control Corp., West Hempstead, N.Y.

Undated. 15 p, 5 fig.

Descriptors: *Gulf of Mexico, *Oil wastes, *Water pollution treatment, *Water pollution control, Equipment, Oil industry, Pollution abatement.
Identifiers: *Pollution defense stations, *Oil containment, *Oil recovery, Oilevator.

The Harding Oil Pollution Defense System, a system for the containment and recovery of oil spills, is presented. Containment procedures are explained and illustrated whereby encirclement of the oil spillage is accomplished by means of a vertical barrier called the Bennett Oil Containment Boom. The recovery of the spilled oil is accomplished by the Oilevator, which 'laps up' the oil by a conveyor belt, leaving behind the sea water. Additional information includes Oilevator specifications and illustration, and independent test reports from Shell Pipeline Company and Imperial Oil Enterprises Limited. The Gulf Coast Plan would establish five Pollution Defense Stations along the Gulf Coast. The stations would be equipped with the Bennett offshore boom and up to 5 Oilevators, and staffed with standby crews. The economics of such a program is explained and a price schedule included. (McEntyre-PAI)
W71-08758

MARINE POLLUTION AND FISHERIES,
Peter Hjul, and David Glen.
A special report on the FAO Technical Conference in Rome, December 1970. Fishing News International, Vol. 10, No. 2, p 12-22, February, 1971.

Descriptors: *United Nations, *Water pollution control, *Water pollution sources, *Water pollution effects, Water law, Monitoring, Control systems.
Identifiers: *FAO conference, Marine pollution, International cooperation.

A summary report is given of the FAO Technical Conference on Marine Pollution and its Effects on Living Resources and Fishing, held December 9 - 18, 1970, in Rome, with 415 delegates attending from over 40 countries and a dozen international organizations. The overall consensus was that marine pollution, while becoming increasingly serious, can still be controlled and abated through scientific endeavor and a global system of monitoring. Topics covered were offshore dumping, mercury poisoning, oil pollution, shellfish vulnerability, industrial pollutants, metal compounds, pesticide pollution, pollution of coral reefs, effects on ecosystems, role of population in pollution, international controls, fishing bans, and an effective global pollution monitoring system. (McEntyre-PAI)
W71-08765

AFTERMATH OF CALIFORNIA SPILL LINGERS,
Bill Rintoul.
Offshore, Vol. 31, No. 4, p 52-53, April, 1971.

Descriptors: *Oil wastes, *Ships, *Legislation, *California, Shore birds, Water pollution control, Legal aspects.
Identifiers: *Oil spill, *San Francisco Bay, *Oil tanker collision.

The collision of two Standard Oil Company tankers beneath San Francisco's Golden Gate Bridge in January 1971, and the resultant 20,000 bbls oil spillage into San Francisco Bay, are described. Cleanup efforts of Standard Oil were commended, with about two thirds of the spillage recovered. Property owners and boat owners brought three class-action lawsuits amounting to billions of dollars in damage against the company. The proposed Congressional port and harbor safety bill, and the bridge-to-bridge communications bill are

discussed. The first bill would strengthen Coast Guard powers to regulate harbor area traffic, including mandatory manning of ship-shore radio circuits. The second bill would require all ships in and around harbors to maintain voice communications by bridge-to-bridge radiotelephone. An examination of how the collision occurred was aided by a sequence of radar pips taken by a Coast Guard automatic camera. Special efforts were made at the bird-cleaning and recovery centers of the San Francisco Zoo and the University of California Services Center to save oil-soaked sea birds, but survival rates were low. (McEntyre-PAI)
W71-08767

WATER POLLUTION FROM PHOSPHATE,
For primary bibliographic entry see Field 05C.
W71-08768

HUGHES V VILLAGE OF NASHWAUK (LIABILITY OF CITY FOR NUISANCE CAUSED BY OVERFLOW OF SEWER).
For primary bibliographic entry see Field 06E.
W71-08769

PHYSICAL DATA POTOMAC RIVER TIDAL SYSTEM INCLUDING MATHEMATICAL MODEL SEGMENTATION,
Federal Water Quality Administration, Annapolis, Md. Chesapeake Support Lab.
For primary bibliographic entry see Field 02L.
W71-08774

BIOLOGICAL AND OCEANOGRAPHICAL SURVEY OF THE SANTA BARBARA CHANNEL OIL SPILL 1969-1970, VOLUME I: BIOLOGY AND BACTERIOLOGY; VOL II: PHYSICAL, CHEMICAL AND GEOLOGICAL STUDIES.
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08776

ECONOMICS OF WATER QUALITY CONTROL MEASURES,
Idaho Univ., Moscow. Water Resources Research Inst.
E. L. Michalson.
Speech at Annual Meeting of Soil Conservation Society of America, Boise, Idaho, Nov 21-22, 1969. 12 p, 1 fig.

Descriptors: *Water quality control, *Economics, *Waste water treatment, Pollution abatement, Idaho, *Planning, Water resources development, Evaluation, Water pollution control.
Identifiers: Environmental quality.

A basin wide water quality control program in Idaho is investigated. Water quality problems in Idaho include agricultural (chemical and animal), municipal (water supply and waste disposal), and industrial (discharge and thermal pollution). Water has two particular characteristics affecting quality control: it has an ability to renew itself, and it has a natural ability to oxidize and stabilize organic wastes on a continuous basis. When the waste load of a stream is too great for the stream to assimilate, there are four alternative methods available to control water pollution: (a) low flow augmentation, (b) prevention, (c) treatment, (d) recycling of effluents. In an economic sense there are two characteristics of water quality that create problems: (1) variability of the water supplies, (2) differentiation of demand for water of various qualities according to uses. Another problem is that benefits are difficult to identify and almost impossible to quantify. For these reasons the major economic interests revolve around the costs of control measures. Costs to society and the industrial polluter need to be determined. Some form of governmental coordination on water quality at the federal level is necessary to insure standards. When the problem of water quality control is adequately defined, then engineers, economists and other research workers can formulate optimal plans. (ray-Chicago)
W71-08807

REVIVING THE GREAT LAKES,
Chicago Univ., Ill. Center for Urban Studies.
John R. Sheaffer.
Saturday Review, p 62-65, Nov 7, 1970. 2 figures.

Descriptors: *Waste water disposal, Area redevelopment, *Water pollution control, *Irrigation water, Crop production, Michigan, Irrigation.
Identifiers: *Muskegon County (Mich).

This article describes the plans for the initiaton of a large-scale water pollution control project on the eastern shore of Lake Michigan in Muskegan County. Using the approach of a 'closed ecological system,' the project will clean up the lake by diverting sewage away from the lake and into production as irrigation water. Although the author explains that the original cost of the project is more than alternative short term treatment plant proposals, the economic potential of the project is enormous. Not only will the newly irrigated lands be able to provide profitable corn production, the employment and recreational possibilities will be expanded as well in the area. (Holmes-Rutgers)
W71-08822

ORSANCO: PIONEER WITH A NEW MISSION,
Peter J. Piecuch.
Environmental Science and Technology, Vol 5, No 1, p 22-23, Jan 1971. 1 fig.

Descriptors: *Water quality control, *Regions, Political aspects, *Water pollution control, Ohio.
Identifiers: *Ohio River, Ohio River Valley Water Sanitation Commission (ORSANCO).

This article describes the regional approach to water pollution control regulation carried out by the Ohio River Valley Water Sanitation Commission during its twenty-two year history. Although ORSANCO, as the commission is referred to, is not a treatment authority, it has been instrumental in monitoring the water quality of the Ohio River and in enforcing the Federal government's and its own water quality standards. The author underlines the importance of the regional in contrast to the federal approach to water pollution control enforcement. (Holmes - Rutgers)
W71-08825

WEEPING LOVEGRASS FOR VEGETATING STRIP-MINE SPOILS IN APPALACHIA,
Northeastern Forest Experiment Station, Berea, Ky.
Willis G. Vogel.
In: Proc First Weeping Lovegrass Symposium, The Samuel Roberts Noble Foundation, Ardmore, Oklahoma, p 152-162, Apr 28-29, 1970.

Descriptors: *Strip mines, *Vegetation establishment, *Cover crops, *Appalachian mountain region, Spoil banks, Grasses, Legumes, Forage mixtures, Hydrogen-ion concentration, Revegetation, Nutrient requirements, Black locust trees, Reclamation, Kentucky.
Identifiers: *Weeping lovegrass, *Strip-mine reclamation, Cover crops.

Weeping lovegrass is useful for vegetating strip-mine spoils in Appalachia because it produces quick cover on a wide range of spoil conditions. It is more tolerant of extremely acid spoils (pH 4.0-4.5) and of dry sites and summer growing conditions than most of the commonly used cool-season grasses and legumes. Although relatively short-lived, it works well in mixtures with slower-developing, long-lived grasses and legumes. It provides the desired quick cover during the first growing season but does not crowd out the companion species, which usually obtain dominance by the third growing season. When sown with direct-seeded black locust, lovegrass is less competiti with the locust seedlings than are the oft-used co season grasses. Nitrogen and phosphorus fertiliz are needed for establishing quick cover of lovegr on many Appalachian coal-mine spoils. (Vog USFS)
W71-08857

SUMMARY OF INTERIM GUIDELINES FO DISPOSAL OF SURPLUS OR WASTE PES CIDES AND PESTICIDE CONTAINERS.
Working Group on Pesticides, Rockville, Md.

Available from the National Technical Informati Service as AD-720 391, $3.00 in paper copy, $0. in microfiche. Working group report WGP-DS Dec 1970. 25 p.

Descriptors: *Pesticides, *Waste disposal, *Ind trial wastes, *Water pollution, Sanitary engine ing, Incineration.
Identifiers: Incinerators, Fire safety, Public hea *Pesticide disposal.

An interim guideline for surplus or waste pestici and pesticide container disposal has been dra from the combined important points of th Working Group reports. WGP-DR-1, Grou Disposal of Pesticides: The Problem and Crit for Guidelines; WGP-DR-2, Proceedings of tional Working Conference on Pesticide Dispo and WGP-DR-3, Information Available on H dling Surplus Pesticides Empty Containers Emergency Situations. Presented in concise fo for ready reference, the subjects of ocean disp (not recommended), ground disposal and incin tion (air disposal) are reviewed. Orientation different pesticide users: householders, farm op tors, commercial operators, governmental auth ties, industrial users formulators, manufactur Ground disposal, its attendant precautions controls, are discussed as well as methods disposal site requirements. Incineration techno to date is outlined as the most applicable metho disposal for large amounts of toxic wastes unusable pesticides. Sections on collection syst as practiced and recommended in various area cluding transportation of surplus pesticides containers, storage considerations with fire safety precautions, disposal site monitoring suggested research bring the whole problem focus. The summary of guidelines provides pre nary guidance with expectation of revision w more definitive solutions are available. Not a s specific recommendations on disposal.
W71-08869

SUMMARY OF FINDINGS ON SOLID WA DISPOSAL SITES IN NORTHEASTERN LINOIS,
Illinois State Geological Survey, Urbana.
G. M. Hughes, R. A. Landon, and R. N. Farvol
Illinois Geological Survey Environmental Geo Notes, No 45, Apr 1971. 25 p, 15 fig, 1 tab,
EPA Grant No G06-EC-00006.

Descriptors: *Landfills, *Illinois, *Water poll control, Path of pollutants, Garbage dumps, Sa ry engineering, Waste disposal, Environm sanitation.
Identifiers: *Sanitary landfills.

If groundwater pollution alone is considered proximately 80% of northeastern Illinois shou suitable for sanitary landfilling with little or n modification, because the surficial material fine textured, have low permeability, and w restrict the movement of leachate. Another should be suitable because of favorable locati the hydrogeologic flow system. Sites in the re ing 10% may require considerable modifica Unfortunately, a large percentage of the proposed as sanitary landfills fall into thi category, a group that includes mined-out qu and gravel pits. Such sites are easily filled, when filled, increase substantially in value. ever, they are not safe landfill sites unless mod

ons are made. Fine-textured sediments, such as lacial tills, are much more effective than more ermeable sands and silts in removing dissolved olids from leachate. Dissolved solids in leachate at travels through 5 feet of sandy clay till are educed approximately the same amount as solids leachate that travels through 600 feet of outwash nd and silt. (Knapp-USGS)
71-08901

TILITY OF RADIOISOTOPE METHODOLOY IN ESTUARY POLLUTION CONTROL STUIES--PART 1: EVALUATION OF THE USE OF ADIOISOTOPES AND FLUORESCENT DYES OR DETERMINING LONGITUDINAL DISPERON COEFFICIENT IN ESTUARIES,Quirk, awler and Matusky Engineers, New York.
uirk, Lawler and Matusky Engineers, New York.
arin A. Abood, John P. Lawler, and Michael D.
sco.
eport available form Nat Tech Inf. Service, ringfield, Va.--Price $3.00 in paper copy. $0.95 microfiche. U S Atomic Energy Commission ew York Operations Office Report NYO-3961-1 ivision of Technical Information TID-4500), igust 1969. 197 p, 44 fig, 3 chart, 27 tab, 73 ref. ppend. USAEC Contract AT- (30-1)-3961.

escriptors: *Streamflow, *Tracking techniques, racers, *Path of pollutants, Fresh water, tuarties, Dye releases, Radioisotopes, Reviews, sts.
entifiers: *Streamflow characteristics.

diotracers and fluorescent dyes used in estuarine dies are compared. The comparison is based on e behavior and characteristics of the tracers, the quired survey equipment, manpower needs, and sociated problems encountered in the field instigation. A detailed procedure is presented for alysis of an instanteously released tracer. This ndbook solution is suitable for selection of the pe of tracer and the required quantity necessary measurement of dispersion and flow characistics in a given river or estuary. Also included : (1) an economic comparison of prototype and draulic model tracer surveys; (2) the merits and advantages of using dyes and radiotracers; (3) ineation of tracer programs for estuarine pollun control studies; and (4) mathematical models scribing the time and space distribution of cers in waterways. (Woodard-USGS)
71-08928

AERATION IN OPEN-CHANNEL FLOW,
ological Survey, Fort Collins, Colo.
r primary bibliographic entry see Field 08B.
71-08936

6. WATER RESOURCES PLANNING

A. Techniques of Planning

GITAL SIMULATION OF THE OGALLALA QUIFER IN SHERMAN COUNTY, RTHWESTERN KANSAS,
nsas State Geological Survey, Lawrence; and ological Survey, Lawrence, Kans.
primary bibliographic entry see Field 02F.
1-08355

MERICAL MODEL OF THE OGALLALA AS MANAGEMENT TOOL,
as Technological Coll. Lubbock. Dept. of Civil gineering.
. Claborn, T. Al Austin, and D. M. Wells.
The Ogallala Aquifer--A Symposium, Texas h University, Lubbock, International Center for d and Semi-Arid Land Studies Special Report 39, p 89-110, 1970. 22 p, 10 fig, 3 tab. OWRR ject C-1537 (No 1993) (2).

Descriptors: *Simulation analysis, *Computer programs, *Water balance, *Aquifers, *Water resources development, Kansas, Recharge, Withdrawal, Discharge (Water), Groundwater movement, Transmissivity, Irrigation water, Municipal water, Water sources, Groundwater, Water levels, Water utilization, Hydrologic budget, Hydrogeology.
Identifiers: *Ogallala aquifer (Texas).

A digital simulation model constructed by the California Department of Water Resources for application in the Riverside-Chino Basin area of Los Angeles County was adapted to a portion of the Southern High Plains of Texas. The portion of the High Plains Underground Water Conservation District Number 1 lying within Potter, Randall, Deaf Smith, Parmer, Castro, Bailey, and Lamb Counties was selected for use in this study. Total area is 3,182.4 square miles. The study area was later reduced to a portion of the original study area lying in Parmer, Lamb, Castro, and Bailey Counties, an area of 2,288.6 square miles. The model should have substantial value to management as a decision making tool, but application is badly handicapped at the present by lack of high quality input data. (See also W71-08349) (Knapp-USGS)
W71-08356

DYNAMIC MODEL OF THE OGLLALA AQUIFER,
High Plains Underground Water Conservation District No. 1, Lubbock, Tex.
F. A. Rayner.
In: The Ogallala Aquifer--A Symposium, Texas Tech University, Lubbock, International Center for Arid and Semi-Arid Land Studies Special Report No 39, p 111-117, 1970. 7 p, 3 fig, 1 ref. OWRR Project C-1537 (No 1993) (3).

Descriptors: *Simulation analysis, *Computer programs, *Water balance, *Aquifers, *Water resources development, *Dynamic programming, Kansas, Recharge, Withdrawal, Discharge (Water), Groundwater movement, Transmissivity, Irrigation water, Municipal water, Water sources, Groundwater, Water levels, Water utilization, Hydrologic budget, Hydrogeology.
Identifiers: *Ogallala aquifer (Texas).

The magnitude of the economic dependence upon the Ogallala aquifer has established a trend to its depletion, and as the water table draws closer to the base of the aquifer, the configuration of the aquifer is undergoing change. Therefore, to economically model this aquifer to a nearly depleted condition requires a dynamic model that can effect its own internal adjustment to compensate for the changes in aquifer configuration. (See also W71-08349) (Knapp-USGS)
W71-08357

NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W71-08392

WATER RESOURCE SYSTEM OPTIMIZATION BY GEOMETRIC PROGRAMMING,
Texas A and M Univ., College Station.
W. L. Meier, Jr., C. S. Shih, and Duane J. Wray.
Available from the National Technical Information Service as PB-199 645, $3.00 in paper copy, $0.95 in microfiche. Water Resources Institute, Technical Report No. 34, Feb 1971, 117 p, 6 fig, 1 tab, 60 ref, 2 append. OWRR Project A-011-TEX (4).

Descriptors: *Optimization, *Optimum development plans, Planning, Design, *Dynamic programming, Linear programming, Water utilization, Costs, *Cost analysis, Filtration, Water purification, Waste water treatment, Model studies, *Computer models.
Identifiers: *Geometric programming, Cost models, *Filtration systems, Computer algorithms.

The aim of this research was to study the applicability and usefullness of geometric programming in water resource planning and design activities. To study the use of geometric programming in practical problem solving, a computer algorithm was developed. A variety of water resources problems were solved using the algorithm. There is a significant need for techniques which will permit design and operation of either proposed or existing water filtration systems. Because the cost models and constraints for water filtration design problems are generalized polynomials, geometric programming would be a good optimization technique to use. Because water filtration problems have not been the subject of optimization analyses in the past to any significant degree, some time was spent in developing cost models and formulating the problem. This effort and the optimization analysis combining linear and geometric programming is described extensively in the report. The report includes a tutorial explanation of geometric programming, a description of the computer algorithm used, the description of the water filtration cost model, and an explanation of the use of geometric programming in an application.
W71-08393

ECONOMIC MODELING IN NATURAL RESOURCE PLANNING,
Rocky Mountain Forest and Range Experiment Station, Tucson, Ariz.
For primary bibliographic entry see Field 06B.
W71-08445

EVALUATION OF THE WORTH OF ADDITIONAL DATA,
Arizona Univ., Tucson. Dept. of Systems Engineering.
Donald R. Davis, and William M. Dvoranchik.
1970. 11 p, 4 ref. OWRR Project B-007-ARIZ (7).

Descriptors: *Evaluation, *Value, *Decision making, *Systems analysis, *Investment, Hydrologic data, Costs, Limiting factors, Analysis, Bridge design, Optimum development plans, Computer programs, Computer models.
Identifiers: *Decision theory, *Uncertainty, *Utility function, *Goal selection, *Bayes risk, Expected variable cost, Opportunity loss, Search routine, Integration, Objective function, Error levels, Rillito Creek (Tucson-Ariz).

Decision processes involve uncertainty which is reduced with information. Because perfect hydrologic knowledge requires highly excessive investment, this paper delineates a method which evaluates uncertainty in hydrologic decision making. The report compares uncertainty to cost, and provides a basis for deciding when additional data is economically excessive. Decision definition, goal selection (utility function), decision making and uncertainity analysis are outlined. An imaginatively treated example of deciding on the depth of bridge piles for Rillito Creed, Tucson, Arizona, is developed in terms of Bayes risk (expected variable cost) and opportunity loss. Programming methodology includes search routine, one- and two-dimensional integration, and objective function. Error levels and limits of integration are evaluated. The computer program took 235 seconds. It indicated that a Bayes risk of $7,479, expected opportunity loss of $2,930, expected opportunity loss of $2756 for an additional year's data beyond 1950 to 1960 record, produced a minimized depth of 16.1 feet. There was a $90 Bayes risk variation from 15 to 17 feet. The object was to minimize the Bayes risk for a given pile depth. (Popkin-Arizona)
W71-08477

DISCRETE DIFFERENTIAL DYNAMIC PROGRAMMING APPROACH TO WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ., Urbana.
Manoutchehr Heidari, Ven Te Chow, Petar V. Kokotovic, and Dale D. Meredith.
Water Resources Research, Vol 7, No 2, p 273-282, Apr 1971. 10 p, 8 fig, 2 tab, 15 ref. OWRR Project B-030-ILL (5).

Descriptors: *Optimization, *Dynamic programming, *Water resources development, Linear programming, Time, Operations, Digital computers.
Identifiers: *Iterative technique, Recursive equation, Trajectories, Invertible systems, Memory requirements.

An iterative method that could ease the difficulties of memory requirements and computer time requirements for the optimization of operating policies of multiple unit and multiple purpose water resources systems by traditional dynamic programming with the use of high speed digital computers was presented. The discrete differential dynamic programming (DDDP) approach was an iterative technique in which Bellman's recursive equation of dynamic programming was used to search for an improved trajectory among the discrete states in the neighborhood of a trial trajectory. The method was used for an invertible, multiple dimensional system and the procedure accuracy and speed was much greater than the accuracy and speed of an interpolation procedure. A simplified system, which was formulated and solved by Laison by linear programming and succesive approximation dynamic programming, was solved by means of the proposed approach. The operating policy of the four-dimensional reservoir network was optimized over 12 operating periods and was used as an illustrative example. By limiting optimization to a few lattice points around a trial trajectory, the memory requirement was curbed substantially and computer time was reduced since fewer tests had to be made per state of each stage. Has 15 references. (Kriss-Cornell)
W71-08500

SPACE-TIME VALIDATION OF A THUNDERSTORM RAINFALL MODEL,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 02B.
W71-08530

AN EXPERIMENT IN DETERMINISTIC WATERSHED MODELING,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
For primary bibliographic entry see Field 02A.
W71-08531

NATIONAL SYMPOSIUM ON DATA AND INSTRUMENTATION FOR WATER QUALITY MANAGEMENT.
For primary bibliographic entry see Field 05A.
W71-08550

COORDINATION - THE KEY TO EFFECTIVE WATER DATA MANAGEMENT,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 05A.
W71-08552

A SYSTEMS APPROACH TO WATER QUALITY DATA MANAGEMENT,
Price Waterhouse and Co., Philadelphia, Pa. Management Advisory Services.
For primary bibliographic entry see Field 05A.
W71-08554

FORECASTING OF WATER QUALITY DATA IN THE DELAWARE RIVER ESTUARY,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 05A.
W71-08557

A MATHEMATICAL MODEL FOR DETERMINING AREAL DISTRIBUTION OF NATURAL RECHARGE IN THE NORTHERN HIGH PLAINS OF COLORADO,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 02F.
W71-08575

PROBABILITY THEORY AS AN AID TO RESEARCH PLANNING,
Wisconsin Univ., Madison. Dept. of Civil Engineering.
Paul M. Berthouex.
Journal American Water Works Association, Vol 61, No 2, p 652-658, 1970. 6 fig, 4 tab, 9 ref.

Descriptors: *Decision making, *Economic prediction, *Pilot plants, *Cost-benefit ratio, Probability, Analytical techniques, Planning, Design data, Model studies, Research and development, Network design.
Identifiers: *Probability theory, Utility theory.

The theory of probability has been used to evaluate the problem of iron removal by oxidation and rapid sand filtration. The efficiency and cost of different treatments are estimated on the basis of simple probability equations for independent, mutually exclusive, and not mutually exclusive events or components. A network diagram and tables provide illustrations of the probability analysis for all possible outcomes. Because the probabilities are assigned subjectively, the suggested approach requires a partnership between the theory and personal judgment. (Wilde-Wisconsin)
W71-08682

CONTINUOUS SYSTEM MODELS OF OXYGEN DEPLETION IN A EUTROPHIC RESERVOIR,
Oklahoma State Univ., Stillwater. Dept. of Chemistry.
Louis P. Varga, and C. Paul Falls.
Available from the National Technical Information Service as COO-2070-1, $3.00 in paper copy, $0.95 in microfiche. Oklahoma State University, Stillwater, Reservoir Research Center (Undated). 33 p, 16 fig, 1 tab, 32 ref.

Descriptors: *Mathematical models, *Reservoirs, *Eutrophication, Computer models, Water quality, Dynamic programming, Reservoir operation, Impoundments, Oxidation-reduction potential, Dissolved oxygen, Water pollution effects, Anaerobic conditions, Dissolved solids, Density currents, Aeration, Biochemical oxygen demand, Chemical oxygen demand, Flow rates.
Identifiers: *Keystone Reservoir (Okla), *Oxygen depletion.

Keystone Reservoir on the Arkansas River (Oklahoma) is fed by two chief tributaries, the Arkansas River of good quality water and the Cimarron River, containing natural brine and four times the dissolved solids of the Arkansas River, thus establishing a deep density current. Because the reservoir shoreline is rapidly becoming urban, natural and cultural eutrophication is anticipated. The long-term objective is to establish a chemical-physical-mathematical model to improve understanding of ecoregulating parameters to serve as a base for comparative studies of other impoundments and give insight into problems of water quality management. Based on the premise that a lake is eutrophic when any portion becomes anaerobic, mathematical simulation models were designed choosing dissolved oxygen concentration as the dependent variable. Mathematical model configurations are described, including linear (along reservoir bottom), depth axis, 10-mesh triangular matrix, 6x18 triangular matrix, time-dependent linear, and branched 10-compartment model; the latter appears the most powerful tool in reservoir ecosystem modeling--not only can the input and output fluxes of any given constituent be monitored at each compartment in the reservoir network, but the effect of each flow rate and chemical reaction rate on the critical fluxes and concentrations can be readily followed and interpreted. (Auen-Wisconsin)
W71-08684

RISK EVALUATION IN SEWAGE TREATMEN PLANT DESIGN,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 05D.
W71-08819

ECONOMIC ANALYSIS OF IRRIGATION SUBHUMID CLIMATE,
Montana State Univ., Bozeman. Dept. of Agric tural Economics.
For primary bibliographic entry see Field 03F.
W71-08824

THE ROLE OF THE DRILLING CONTRACT OVERSEAS AS SEEN BY THE OPERATOR,
Amoco International Oil Co., Chicago, Ill.
J. T. Wilson.
Paper, Thirtieth Annual Meeting American sociation of Oilwell Drilling Contractors, Dal Texas, Sept 22-25, 1970. 6 p.

Descriptors: *Oil industry, *Foreign proje *Drilling, Foreign construction, Contracts.
Identifiers: *Overseas contracting, Drilling c tractor responsibilities, Functions, Problems.

This paper presents the would-be drilling cont tor with the opportunity of knowing what to ex if a overseas contract is accepted. Although terpreted through the experiences of an Ameri Oil company active in overseas operations, presentation offers many helpful hints for the w well contractor interested in overseas drilling c tracts. An understanding and appreciation of: the overseas political and social environment; the unusual logistical problems and (3) the so times complex financial structure, are neces prerequisites to a successful operation oversea the contractor. (Campbell-NWWA)
W71-08841

GENERAL HYDRAULIC SYSTEM MODEL,
Illinois Univ., Urbana. Dept. of Hydraulic gineering; and Madras Univ., India College of gineering.
For primary bibliographic entry see Field 04A.
W71-08909

6B. Evaluation Process

A STUDY OF THE EFFECTS OF INST TIONS ON THE DISTRIBUTION AND USE WATER FOR IRRIGATION IN THE LO RIO GRANDE BASIN,
Texas A and M Univ., College Station.
Roy M. Gray, and Warren L. Trock.
Available from the National Technical Inform Service as PB-199 647, $3.00 in paper copy, $ in microfiche. Technical Report No 36, M 1971, 92 p, 2 fig, 20 tab, 40 ref. OWRR Proje 025-TEX (8).

Descriptors: *Institutions, Planning, *Irriga *Water rights, Irrigation districts, Cost, *Wat location, Irrigation efficiency.

Parametric linear programming was use analyze the impact of negotiable water righ cropping patterns and enterprise combinatio the institution of water rights were changed so make annual allotments negotiable, market f could be expected to move the resources int in which it has a higher value. Water price varied from $9.60 per acre foot to $96.00 pe foot. At a price of $9.60, which is approxim the present cost of irrigation water delivered farm gate, producers could profitably use a 2,000,000 acre feet of water per year. At this 83 percent of the irrigable lands and 77 perc the water used in the Valley would be devo the production of cotton and grain sorghum water price of $18.65 per acre foot or higher, sorghum production in the Valley (Lowe Grande Basin) reverts dryland and water use

ation drops to 1,363,300 acre feet per year. At a ce of $32.45 or above, the land devoted to cot- would be switched to dryland grain sorghum oduction and water use would decline to 407,900 e feet annually. The use of parametric pro- mming with variable water pricing allowed the ivation of a value-in-use or 'conditional de- nd' curve for water. Rehabilitation of district ilities was analyzed using data from the paramet- programming model for five levels of develop- nt. It was found that rehabilitation of district ilities is economically feasible, at present level vater use in the Valley.
1-08395

ONOMIC MODELING IN NATURAL SOURCE PLANNING,
cky Mountain Forest and Range Experiment tion, Tucson, Ariz.
l F. O'Connell.
ceedings, 14th Annual Arizona Watershed nposium, Phoenix, Sept 23, 1970, p 31-38, 1. Economic Evaluation of Watersheds in the thwest.

scriptors: *Model studies, *Systems analysis, anning, *Economic impact, *Natural resources, tersheds (Basins), Arizona, Chaparral, Multi- purpose projects, Resource allocation, En- nmental effects, Cost-benefit analysis, Wildlife nagement, Economic efficiency, Intangible efits, Linear programming.

nomics involves human goals, both market and -market, and economists are not merely ac- ntants, but social scientists. Multiple use urce management is a question of economic leoffs and therefore deserves discursive nomic analysis. Cost-benefit analysis usually e for large reservoir and reclamation projects deficient because market value methodology is ting, secondary negative effects and marginal lyses are not considered, and detailed cost and efit information are developed for only one al- ative. Using these factors with optimum duct mix considerations, the author attempted a t-benefit analysis model for multiple use natural urce planning in the Salt-Verde Basin, Arizona. objectives were: (1) An analysis of alternate ershed management programs in the area, con- ring all known products, alternative treatments alternative input quantities in order to find an imal combination, (2) Assessment of alternative gram impacts on national, regional and local nomic areas. Pert diagrams for data collection processing are outlined and a linear program del was constructed, which shows how various binations of treatments effect differing out- s. Data collection methods in the National est are described. Coefficients for inputs, out- s and treatments were developed and a sensitivi- nalysis was utilized to determine their effect on outcome of the model. Data collection is the t costly part of the entire procedure. The model apable of evaluating both non-market and mar- factors. Model applications to a chaparral area, n 4 alternatives, are described. (Casey-Arizona)
1-08445

E CALIFORNIA WATER PLAN,
ghborough Univ. of Technology (England).
nard M. Cantor.
rnal of Geography, Vol 68, No 6, p 336-371, t 1969.

criptors: *Inter-basin transfers, *California, ater storage, *Dams, *Planning, Conveyance ctures, Central Valley Project, Irrigation dis- ts, Drainage systems, Arid lands, Pumping its.

California Water Plan has been devised to sport water from its origin in the northern part he state to the southern part where the highest centration of population and the greatest need irrigation and industrial development exist. ious components dams, aqueducts, pumping stations, and reservoirs - have already been completed, and others are under construction or in the planning stages. Criticism has developed focussing on inadequate drainage systems, increasing salinization, and skyrocketing costs. It is suggested that by the time the project is completed in 1980 desalination of seawater will be competitive in cost, and could have avoided the detrimental environmental effects of the present plan. (Casey-Arizona)
W71-08446

NEGLECTED RESOURCE,
Moscow State Univ. (USSR). Dept. of Soil Science.
V. A. Kovda.
Presented at an international conference 'Arid Lands in a Changing World,' Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 473-479, 1970. 1 ref.

Descriptors: *Arid lands, *Water supply, *United Nations, *Irrigation practices, *Productivity, Water resources development, Social aspects, Organizations, Investment, Natural resources, Scientific personnel.
Identifiers: *Agrarian reform, *Developing countries, *Green revolution, *Development obstacles.

If one compares the speed of change in different geographic areas of the world, the arid areas suffer by the comparison. The time has therefore come to reevaluate traditional approaches to the problem of aridity. The problem of water supplies has been somewhat alleviated by great advances in groundwater exploration and advances in desalination combined with contemplated interbasin transfers should eventually have great impact on arid areas. The green revolution has led to great crop production increases but the picture is mixed. Dryland farming productivity remains low, irrigation efficiency is low and salinity problems are increasing in irrigated areas. Many international organizations are helping, but the basic fact of 5-10 cents per capita investment in arid-zone science as compared with 2-7 dollars per capita in developed countries shows that international organizations can at best play only a catalytic role in development in underdeveloped countries. There are 4 major obstacles to future progress: (1) Low industrial potential, which is the crucial obstacle; (2) Agrarian reform, which would provide incentives to the population; (3) The great need for natural resource surveys; (4) The outmigration of native scientists to the developed countries. (Casey-Arizona)
W71-08448

UNRESOLVED ISSUES,
Chicago Univ., Ill. Dept. of Geography.
Gilbert F. White.
Presented at an international conference, 'Arid Lands in a Changing World,' Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90 , AAS, p 481-491, 1970.

Descriptors: *Arid lands, *Social aspects, *Water resources, *Education, *Economic feasibility, Irrigation practices, Ecology, Natural resources.
Identifiers: *Population pressures, *Underdeveloped countries.

This was the final paper presented at the international symposium, and the author summarizes the differences in problem perception between this symposium and a similar symposium on arid lands 14 years ago. The major difference is the shift in emphasis away from purely technological concerns with water development and agriculture toward the increasing realization that social problems are critical in resource development. Major social problems revolve around the grim fact of overpopulation combined with massive migrations from rural regions to urban areas, thus depriving rural regions of important segments of their population. Also, it is being learned that investments in education pay much higher returns than investments in structures. There have been many important advances in arid regions such as a rising tendency to look for multiple solutions to resource problems, heightened attention to the ecological impacts of man's activities and increased scientific information flow. Nevertheless, the disparities in income between rich and poor countries are growing. Five major unresolved issues emerged at the symposium: (1) the importance of irrigation; (2) expansion vs. intensification of new development; (3) the value of single large projects compared to several small projects; (4) the role of amenities; (5) research in basic relationships vs. problem-solving. (Casey-Arizona)
W71-08450

RESOURCES OF ARID SOUTH AMERICA,
Universidad Agraria, Lima (Peru). Facultad de Ingenieria Agricola.
Arturo Cornejo.
Presented at an international symposium, 'Arid Lands in a Changing World', Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 345-380, 1970. 16 fig, 7 tab, 46 ref.

Descriptors: *Arid lands, *Water resources, *Climatic data, *Natural resources, *Water law, Geographical regions, Foreign lands, Deserts, History, Water resources development, Planning, Vegetation, Anticyclones, Ocean currents, Mountains, Economics, Rivers, Aquifers, Lakes, Groundwater, Reservoirs, Watersheds (Divides), Crops, Irrigation practices, Legal aspects, Water use, Water rights.
Identifiers: *Atacama Desert, *Peruvian Desert, *Chile, *Peru, *South America, Argentina, Brazil, Venezuela, Monte Desert, Patagonian Desert, South Pacific Anticyclone, Peruvian Current, Andean Cordillera, Coastal deserts.

The coastal deserts of Chile and Peru, the Atacama Desert of Chile, the Monte and Patagonian Deserts of Argentina and small regions of Brazilian northeast and coastal Venezuela constitute the major desert regions of South America. The great coastal desert and its interior region, the Atacama, are caused by the interacting effects of the South Pacific Anticyclone, the cold Peruvian Current and the limiting barrier of the Andean Cordillera. The coastal desert experiences fog and temperature constancy, both of which are absent from the Atacama. The mineral soil and offshore resources of these 2 deserts are described. The historical development of irrigation agriculture in the Peruvian Desert is reviewed and compared with modern agriculture in the area, where there are a large number of small rivers. The growing of rice in the Peruvian Desert resulting in drainage and salinity problems is an example illustrating the problem of introducing crops from humid areas into arid regions, resulting in poor use of limited water resources. Another problem is the building of large cities, such as Lima, on fertile valley soils. The natural regions of these deserts are described and needed research proposed. Actual and potential water resources are also considered in detail. The author feels that a new water law is needed in Peru, where agrarian reform signifies a rational redistribution of irrigation water rights. (Casey-Arizona)
W71-08456

GEOGRAPHIC CONSIDERATIONS IN PLANS FOR DEVELOPMENT,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 03F.
W71-08459

PRODUCTIVITY OF ARID AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Rangelands Research Unit.
For primary bibliographic entry see Field 03F.
W71-08460

PUBLIC ACTION: REQUISITE FOR SUCCESS,
William E. Warne.
Presented at an international conference, 'Arid Lands in a Changing World', Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 411-420, 1970. 8 ref.

Descriptors: *Irrigation districts, *Water contracts, *Social aspects, *Arid lands, *Planning, California, Legal aspects, Economic efficiencies, Education, History, Water permits, Foreign lands, Water policy, Water users, Public benefits, Governments, Organization.
Identifiers: *Iran, *California State Water Project, *Dez Irrigation Project.

A crucial part of world food supplies are grown on irrigated lands, particularly in arid and semiarid regions. The production of such regions must be doubled, through creation of new water projects, by the year 2000. The construction of a water project involves physical and engineering problems in the planning and building of appropriate structures. Its efficient utilization involves the creation of appropriate social and legal institutions, such as irrigation districts. The author maintains that the latter is too often neglected. The collapse of irrigation agriculture in ancient Mesopotamia and the difficulties of initiating water projects in 19th century California are cited as consequences of collapsing or badly-developed water institutions. By contrast, the successes of the California State Water Plan and the Dez Irrigation Project in Iran are described in detail to illustrate the importance of such institutions. Governmental stability, social innovation and user involvement are all vital ingredients in the creation of water project institutions. (Casey-Arizona)
W71-08461

HYDROLOGICAL RESEARCH IN SOUTH AFRICA,
University of the Witwaterstrand, Johannesburg (South Africa). Dept. of Civil Engineering.
D. C. Midgley.
South African Journal of Science, Vol 66, No 12, p 380-391, Dec 1970. 58 ref.

Descriptors: *Hydrology, *Surface waters, *Groundwater, *Research and development, *Data collections, Floods, Droughts, Water resources, Evaporation, Silt, Streamflow forecasting, Rainfall.
Identifiers: *South Africa.

In the past, practically throughout the entire subcontinent of southern Africa, hydrological research efforts have concentrated mainly on ad hoc problems within state organizations. More recently there has been an upsurge of interest in several state universities and among consulting civil engineers. Engineering problems associated with surface waters involve either too little or too much water. The research problems, measurement techniques, and accumulated data in South Africa are reviewed for streamflow, rainfall, flood studies, droughts, water resource surveys, evaporation and river silt loads. It appears that the combination of erratic rainfall, erratic river flow, high evaporation and heavy siltation calls for an enlightened philosophy of water resources development in the subcontinent. In view of the great reliance on groundwater in many areas there is surprisingly little research in groundwater hydrology. The greatest advances in data accumulation are likely to result from broad-scale coordination of information from scattered areas rather than from reliance on a few localized large hydrological research stations. (Casey-Arizona)
W71-08466

THE LITANI RIVER OF LEBANON: AN EXAMPLE OF MIDDLE EASTERN WATER DEVELOPMENT,
Morgan State Coll., Baltimore, Md. Dept. of Geography.
James Hudson.
Middle East Journal, Vol 25, No 1, p 1-14, Winter 1971. 1 fig, 23 ref.

Descriptors: *Water resources development, *Arid lands, *Consumptive use, *Water allocation (Policy), *Cost-benefit analysis, Irrigation, Hydroelectric power, Thermal power, Urbanization, Water costs, Precipitation (Atmospheric), Evapotranspiration, Political aspects, Social aspects, Runoff, Economic feasibility.
Identifiers: *Lebanon, *Middle East, *US Bureau of Reclamation.

Problems in the water resource development of the Litani Basin of Lebanon are typical of those in many similar basins of the arid Middle East. The major source of basin water is precipitation in nearby mountains, which is variable in time and amount. Over half is lost by evaporation and transpiration while the rest either appears as runoff or moves through groundwater channels to reach the river via springs. In the Basin as a whole, average annual flow is 700 million cubic meters. Flow variation is less marked than precipitation seasonality would suggest. The primarily urban uses of water (hydroelectricity, municipalities, industry and thermal cooling) are less consumptive than irrigation, thereby allowing for much greater reuse efficiency. This was made plain in a U.S. Bureau of Reclamation economic analysis in its plan for the Litani, which estimated the lower annual income and higher operating costs of an irrigation scheme as opposed to a hydroelectric scheme. When the Litani project was built, irrigation and municipal uses were deferred and so far only hydroelectric power has been produced. Although pressures are developing for irrigation water, the government has so far resisted them. This illustrates the problem of priorities in water development and the probable fallacies of the dream of Making the Desert Bloom. (Casey-Arizona)
W71-08479

THE SOIL AND WATER RESOURCES OF THE LOWER INDUS REGION
Sind Univ., Hyderabad (Pakistan). Dept. of Geography.
M. M. Memon.
Oriental Geographer, Vol. 13, No. 1, p. 41-54, Jan 1969. 3 fig, 5 tab, 12 ref.

Descriptors: *River basins, *Surface waters, *Groundwater, *Irrigation efficiency, *Water requirements, Water conservation, Aquifers, Soil types, Saline soils, Evapotranspiration, Water resources, Crop response, Productivity, Arid lands, Irrigation practices.
Identifiers: *West Pakistan, *Indus River, *Waterlogging.

Although the economy of West Pakistan is dominated by agriculture, irrigated crop yields are very poor and production/acre and production/capita steadily declined in the 1955-65 decade. This is particularly serious in view of the 2.38 percent/year population increase rate. Because the region is hot and arid, high evaporative demand requires an irrigation depth of 3.5 feet. Therefore, although about 13 million acres are available for cultivation, current water resources dictate a restriction to 7-8 million acres. Although the alluvial soils of the region are fertile, faulty irrigation and agricultural practices have resulted in water wastage, soil deterioration and aggravation of salinity and waterlogging problems. It is recommended that the poorer soils be withdrawn from production and surface and groundwater supplies be further developed and allocated only to the areas with the best soils, thereby allowing intensive cropping, increased use of fertilizers and other imputs. (Casey-Arizona)
W71-08482

RETURNS FROM BEEF ON IRRIGATE PASTURES VS. RETURNS WITH OTHE CROPS,
Economic Research Service, Washington, D. Farm Production Economics Div; and Agricultu Research Service, Brookings, S. D.
For primary bibliographic entry see Field 03F.
W71-08488

THE URBAN SNOW HAZARD: ECONOM AND SOCIAL IMPLICATIONS,
Illinois Univ., Urbana. Water Resources Center.
Duane D. Baumann, and Russell Clifford.
Available from the National Technical Informati Service as PB-199 711, $3.00 in paper copy, $0. in microfiche. Water Resources Center, Univers of Illinois, Urbana, Research Report No 37, UIL WRC-71-0037, Apr, 1971. 149 p, 14 fig, 30 t OWRR Project B-032-ILL (1).

Descriptors: Snowfall, *Cities, *Social aspec Evaluation, Costs, Urbanization, *Decision m ing, *Hazards, *Snow management.
Identifiers: Public service, *Snow hazard.

The snowhazard is urbanized North America small because snowfalls are frequent, recurri and expected. The costs of adjustment are hi relative to other natural hazards, and the platte of adjustments, public, are reasonably well ganized. The damage pattern is one of act disruption rather than one of death and destr tion. A method was developed for use in inform municipal decisions concerning what is, in northern tier of states, an expensive public servic W71-08493

METROPOLITAN WATER MANAGEME CASE STUDIES AND NATIONAL POLICY PLICATIONS.
Urban Systems Research and Engineering, I Cambridge, Mass.

Available from National Technical Informa Service as PB-199 493, $6.00 paper copy, $0 microfiche. Report NWC-EES-71-002, 1971. p. National Water Commission Contract Num NWC 70-030.

Descriptors: Administrative agencies, *Ci *Decision making, *Economics, *Governm supports, *Institutional constraints, *Plann *Water policy, *Water quality control, *W supply, Federal government, Forecasting, Ins tions, Legal aspects, Massachusetts, On-site vestigations, Operations, Personnel, Poli aspects, Recreation, Sewage treatment, Sewer Social aspects, State governments, Texas, Wash ton, Water distribution (Applied), Wisconsin.
Identifiers: Boston, *Lubbock, *Milwaukee, *S tle.

A study of the planning, decision making, and plementation practices in urban-water man ment was made in 12 metropolises. Four were amined in detail onsite: Boston, Lubbock, Mil kee, and Seattle. Water supply, sewage collect sewage treatment, water-quality control, water-based economic and recreational act were examined for range of objectives, techn and institutional approaches, exogenous fluences, future problems and trends, and the e of Federal policies. Specific recommendation Federal action to improve financing, perso practices, operations, availability of data analyses, and the institutional and legal framew of water planning, decision making, and imple tation are made.
W71-08516

NEED FOR WATER QUALITY DATA PLANNING WATER RESOURCE DEVEL MENTS,
Geological Survey, Lincoln, Nebr. Resources Div.
For primary bibliographic entry see Field 05A.
W71-08558

RECREATIONAL BOATING POPULATION
ATISTICAL INFORMATION SYSTEM,
rmation Concepts, Inc., Arlington, Va.
man C. Smith, and Henry Linsert, Jr.
ilable from the National Technical Information
ice as AD-723 739, $3.00 in paper copy, $0.95
icrofiche. Final Report Vol I , Feb 1971. 380
6 tab, 4 append.

criptors: Boats, *Boating, *Recreation, Recrea-
al demand, Surveys, *Census, Statistics, Popu-
n, Distribution patterns.
tifiers: Boat accidents, Boat operators, Boating
stics, Recreational boating, Water safety.

report describes Recreational Boating Activity
e 5th U.S. Coast Guard District--the District of
mbia and the states of Maryland, North
lina, and Virginia--from 1 August 1969,
ugh 31 August 1970. It summarizes the results
e fact finding phase of a Coast Guard effort to
lop and test a Recreational Boating Population
stical Information System. To improve
wledge for boating safety resources data and
ates were compiled on the characteristics of
eational boaters, the boats they use, and the
ous kinds of recreational boating activity they
ge in.
-08593

V I LENIN KARAKUM CANAL IN THE
KMEN SSR,
primary bibliographic entry see Field 03F.
-08645

NOMIC FACTORS IN THE DEVELOP-
T OF A COASTAL ZONE,
achusetts Inst. of Tech., Cambridge.
Devanney, III, E. Debris, W. Seifert, and W.
d.
rt No MITSG 71-1, 1970. Various paging.

riptors: *Coasts, *Economics, *Water
gement, *Cost-benefit analysis, Harbors,
rnment supports, Feasibility studies.
ifiers: *Coastal zone development, *Coastal
management system, Lovel Island, Boston
or.

omic issues examined in the development of
al zone include economic efficiency, failure of
rivate market to allocate the coastal zone effi-
y, parochial benefits, inefficient local control,
he unpredictable future. Cost-benefit analysis
cribed, and practical problems and limitations
ved in its application to the coastal zone ex-
ed by investigation of the development of
Island in the Boston Harbor. Regionwide
opment strategies are explored, with coastal
management system outlined. The key fea-
of this system are: (1) provision of municipal
es through user charges; (2) a state regulato-
d enforcement agency; and (3) federal ap-
h of state management plans enforced by
al funding of the state level organization. Final
usions are that because private market and
control would not work, state and federal ac-
for coastal zone development is essential;
s for determining what is an efficient alloca-
f the shoreline can, for many decisions, be a
rly developed and applied cost-benefit analy-
IcEntyre-PAI)
08753

ENGINEERING - THE CHALLENGE OF
OURCE DEVELOPMENT,
rnia Dept. of Fish and Game, Stockton.
E. Skinner.
Resources Bulletin, Vol 7, No 2, pp 355-
April 1971.

iptors: *Environment, *Resource Develop-
*Ecology, Conservation, Aesthetics, Safety
s.
fiers: *Eco-engineering, Quality of life,
vable resources, Regulatory agencies.

It is presumed that the present environmental thrust is not a wholly transitory fad; that there will be a residual impact on American society which will demand greater consideration in the future of ecological and environmental values by resource developers and public works agencies. An example is cited to show the validity of the environmental thrust and the severe consequences of ignoring it under the present emphasis on this aspect of resource development. An attempt is made to understand some of the reasons for the dramatic change in public attitude toward the environment and opposition to projects of apparent benefit to society. It is suggested that basic changes in philosophy and concept will be necessary in the field of resource development. Some broad ecological and developmental guidelines are provided in the interest of implementing environmental considerations. Finally, those involved in resource development and public works are challenged to accept the concept of eco-engineering; a concept combining the competing elements of resource development and conservation. (Wray-Chicago)
W71-08802

PROJECT 2000, A PLANNING IMPERATIVE,
Bureau of Outdoor Recreation, Washington, D.C.
Herbert M. Runkle, and Thomas H. Perkins.
Water Resources Bulletin, Vol 7, No 2, pp 348-354, April 1971.

Descriptors: *Planning, *Social change, *Decision making, *Social aspects.
Identifiers: *Social planning, Water Resources Planning.

Wider social planning is badly needed for the prolonged survival of man on the earth. Reasonableness requires blending of planning and construction--but a sharp line of independence is essential. Through intensive professional development and achievement of professional expertise, many outstanding technicians often move into vital decision making positions within their respective agencies. As planners, they see part of the action but miss the big picture. Problem solutions become restricted to agency or individual authorities and are not always the best alternatives. Thus, the planning field is overflowing with solutions to our every problem, but the solutions themselves often carry their own problems. (Wray-Chicago)
W71-08803

ARE SHORT-TERM ENVIRONMENTAL ACTION PROGRAMS POSSIBLE--THE INLAND LAKE PROJECT EXPERIENCE,
Wisconsin Univ., Madison. Water Resources Center.
Stephen M. Born.
Water Resources Bulletin, Vol 7, No 2, p 252-259, Apr 1971.

Descriptors: *Environment, *Eutrophication, *Lakes, Lake shores, Resource development.
Identifiers: *Upper Great Lakes Region, Inland Lake Demonstration Project, Snake Lake, Horseshoe Lake, Environmental problems.

A clear trend in recent years has been the increased public awareness of environmental deterioration and pollution. Society appears willing to support long-range fundamental research in environmental areas (such as eutrophication research) as long as action programs (such as lake renewal) are undertaken too. The experiences of the Inland Lake Demonstration Project afford an opportunity to evaluate one kind of short-term action-oriented response. The broad objectives of the Project have been the demonstration of techniques to restore, maintain, and protect a high quality environment in lakes and on shorelands within the Upper Great Lakes Region. Snake and Horseshoe Lakes were sites chosen for lake renewal activities. The most difficult problems of trying to execute short-term environmental programs is the frequent inadequacy of scientific knowledge to guide problem definition, treatment selection, and prediction of results. (Wray-Chicago)
W71-08804

WATER RESOURCES RESEARCH, A CHALLENGE TO THE SOCIAL SCIENTISTS,
Utah Water Research Lab., Logan.
Dean F. Peterson.
Utah Water Research Laboratory, Utah State University, Occasional Paper 2, Logan, Utah, June 1968. 8 p.

Descriptors: *Water resources development, *Social values, Decision making, *Planning.
Identifiers: *Social scientists.

This paper deals with the role of engineers and social scientists in developing effective water resources plans. New standards are needed for making decisions about water resources. Planning requires all kinds of scientists, including social scientists. Relative values must be placed on water resource goals: conservation, aesthetics, improved living standards, etc. Decision making also involves the participants, and reaching a consensus of the majority without sacrificing minority needs. Water is a major resource with which man is concerned, and its development, therefore, must have some significant relationship to human institutions and values. In addition, technological and economic factors must be considered. For effective planning a team approach, with technologists and social scientists, holds the best possibilities. (Wray-Chicago)
W71-08805

FEDERAL ROLE IN THE URBAN ENVIRONMENT,
Department of Housing and Urban Development, Washington, D.C.
Robert C. Wood.
Public Administration Review, Vol 28, No 4, p 341-347, Aug 1968.

Descriptors: *Environment, *Urban renewal, *Urbanization.
Identifiers: Metropolitan areas, Model cities.

This paper deals with how the government can cope with the expected urban growth in this country. Starting in the 1930's, pressure mounted for federal urban representation. It culminated in 1965 in the Department of Housing and Urban Development. Various aspects of the Department's work include: (1) private mortgage market, (2) central city problems, (3) metropolitan areas and urbanizing countryside, (4) model cities and developmental work in intergovernmental relations. In addition to these program groupings, three steps were taken to assure a more effective Department: (a) consolidation of the Department's administrative function, (b) appointment of a deputy under secretary for policy analysis and program evaluation, (c) designation of a Budget Review Committee. With only a few years of operation, several trends are recognized--an integrated approach to urban problems, development of broader support bases, and strengthened legislative tools. It is hoped that with federal assistance in urban development new building techniques will emerge, land costs will be lowered, a wide range of housing designs will be provided, and new jobs will be created. (Wray-Chicago)
W71-08806

COMPLEMENTING OBJECTIVE PROCEDURES WITH SUBJECTIVE PRIORS IN WATER RESOURCES PLANNING,
Temple Univ., Philadelphia, Pa. Economic Research Service.
P. Thomas Cox, and Bernard Siskin.
Water Resources Bulletin, Vol 7, No 2, p 368-375, Apr 1971.

Descriptors: *Decision-making, *Planning, *Evaluation.
Identifiers: *Stepwise multiple discriminant analysis, Water resource project, Prior probabilities.

A procedure is outlined which allows consideration of both objective and subjective indicators to establish priorities in plan implementation of water resource development. The objective procedure utilizes stepwise multiple discriminant analysis to predict community performance regarding planned project implementation, based on previous project implementation in the Northeast. The subjective procedure incorporates prior probabilities developed by the planner, based on observation and experience gained through the planning process. The proposed analysis could eliminate waste through better allocation of planning funds to implementation studies exhibiting higher probability of early implementation. (Wray-Chicago)
W71-08808

ROCKY MOUNTAIN URBAN WATER GOALS,
American Society of Civil Engineers, New York. Urban Water Resources Research Program.
M. B. McPherson.
Journal of American Water Works Association, Vol 63, No 3, p 176-180, Mar 1971. OWRR Project C-1536 (No 1992) (6).

Descriptors: *Urban areas, *City planning, *Urbanization, Planning, Regions.
Identifiers: *Rocky Mountain, *Urban water resources, Metropolitan areas, Comprehensive management, Regional development.

The author has attempted to indicate that while eastward Rocky Mountain states have been heretofore relatively unaffected by the burgeoning urbanization taking place in much of the rest of the United States, there is a high probability that emerging national policy on urban dispersion may cause in-migration that will result in much greater urban populations in those states than suggested by projections based on past and present trends. Comprehensive management of urban water resources is inhibited by: the fractionalized character of local government in metropolitan areas; the incomplete resolution of national policies on urban growth, water quality, and environmental quality; the absence of adequate information and data for satisfactory analysis of the urban system; incomplete valuation methodologies for water-resource planning and development; and a confusion of federal agency metropolitan programs. Much can be learned from others sharing similar problems, and the 'information explosion' should not be deplored but aggressively exploited. (Wray-Chicago)
W71-08809

WATER RESOURCES DEVELOPMENT IN AN ENVIRONMENTALLY-CONSCIOUS ERA,
Sierra Club, Los Angeles, Calif. Angeles Chapter.
Alan Carlin.
Water Resources Bulletin, Vol 7, No 2, p 221-227, Apr 1971.

Descriptors: Environment, Economics, Taxes, Water rights, Inter-basin transfers, Conservation, *Water resources developments, *Evaluation.
Identifiers: *Environmental quality, Tax law, Sierra Club.

The Sierra Club has come to the conclusion in recent years that much more basic reforms are required in water resources development activities if the demands for environmental quality now evidenced by the American people are to be satisfied. Among the urgent reforms with indirect effects are those involving revision of the procedures used in evaluating proposed projects. These procedures should be revised so that future evaluations will much more accurately reflect the economic and environmental merits of proposed projects. Basic reforms of tax policies are also needed that will eliminate most of the private profit available to those who can persuade the government to increase the value of their land through the construction of water projects. Finally, some additional actions can be taken that will have a direct impact on lessening the adverse environmental impact of water projects beyond the provisions of the National Environmental Policy Act of 1969. (Wray-Chicago)
W71-08810

PROCEEDINGS OF A CONFERENCE ON WATER RESOURCES PLANNING AND PUBLIC OPINION.
Nebraska Univ., Lincoln. Water Resources Research Inst.

Available from the National Technical Information Service as PB-199 916, $3.00 in paper copy, $0.95 in microfiche. Conference held Mar 8-9, 1971, edited by Warren Viessman, Jr, Apr 1971. 80 p. OWRR Project A-999NEB (3).

Descriptors: *Planning, Water resources development, *Decision-making, *Social aspects, Social values, Social participation, *Public policy, Psychological aspects.
Identifiers: *Public opinion, Public involvement, Environmental policy.

This conference was designed to acquaint water resources planners, managers, developers, researchers, and educators with public opinion. The conference dealt with such basic questions as: What is public opinion. How can planners assess it. In what ways can the planner take advantage of existing opinion. How can public opinion be shifted in favor of the planner's innovation. (See also W71-08812 thru W71-08814)
W71-08811

THE PUBLIC DECISION-MAKER AS REPRESENTATIVE AND SPECIALIST: AN EXPLORATION IN LOW SALIENCE POLITICS,
Florida State Univ., Tallahassee.
Norman Luttbeg.
In: Proceedings of a Conference on Water Resources Planning and Public Opinion, University of Nebraska, p 2-26, Mar 1971.

Descriptors: *Decision-making, *Public policy, *Social aspects, Social values, *Planning.
Identifiers: *Public opinion polls, *Public involvement.

This paper looks at the public opinion polls and society's attitudes and participation in government in order to suggest methods applicable to decision-makers in the area of water resource utilization. The most important element of information concerning public opinion is to identify those instances in which the public will permit a decision by professionals versus those in which they expect their elected representatives to be responsive to public opinion. Every effort to measure existent public opinion with survey research is recommended. Other ideas highlighted are that the public does not expect to be represented at all times; public policy need not always follow public opinion. Also, when seeking the adoption and public acceptance of water resource utilization proposals, the support of elected leaders is vital. (See also W71-08811) (Wray-Chicago)
W71-08812

SOCIO-ECONOMIC RESEARCH WITHIN PUBLIC LAW 88-379,
Office of Water Resources Research, Washington, D.C.
Garland H. Hershey.
In: Proceedings of a Conference on Water Resource Planning and Public Opinion, University of Nebraska, p 69-76, Mar 1971.

Descriptors: *Water resources development, *Planning, Decision-making, *Social aspects, Social values.
Identifiers: *Socio-economic research, *Public involvement, Interdisciplinary studies, Environmental policy.

This paper looks at the Water Resources Research Act of 1964 which created the Office of Water Resources Research. From its inception, the OWRR has been interested in carrying out socio-economic research in the water resources field. Top priority has been given to methodology and criteria for water resources planning. Interdisciplinary research is supported, especially that focusing on economic, political, social, legal, and organizational problems associated with the Nation's water future. Examples of some interdisciplinary projects and public opinion research are cited. Water resources research is continually interested in finding effective methods of involving an informed public in the decision-making process. (See also W71-08811) (Wray-Chicago)
W71-08813

CHANGING PUBLIC OPINION: PROBLEMS AND PROSPECTS,
Florida State Univ., Tallahassee.
Donald F. Smith.
In: Proceedings of a Conference on Water Resources Planning and Public Opinion, University of Nebraska, p 45-59, Mar 1971.

Descriptors: *Decision-making, *Social values, Social aspects, Psychological aspects, *Planning, Social participation.
Identifiers: *Public opinion, *Advertising, Mass media.

This paper deals with the success of advertising campaigns as a method of changing public opinion about governmental policy as it is applied to water resources development. It is suggested that many present advertisers were trained in the 1930-40-50's and utilize stimulus-reinforcement theories. The author's proposal is to consider any attempt to change public opinion as a diffusion process. A process in which a deliberate attempt is being made to diffuse throughout the public an acceptance of some new idea, proposal or practice. This concept views man as a creature that actively interacts with in-coming messages, selecting some, avoiding some, and modifying some. Second, this model views man in society as an intricate network of social relationships, many of which play a part in the process of framing and changing opinions. A basic result of research in this area has been the identification of a four-stage sequence through which individuals go as they come to accept something new. The first stage is awareness, second-interest, third-evaluation, and four-decision. Some conclusions are (1) mass media alone is insufficient to change public opinion, (2) detailed grass-roots organizations in which individuals meet face-to-face are important, (3) there is need to construct messages to fit compatibly with existing opinions, (4) use of differing media and messages is helpful, (5) starting early to inform is advantageous. (See also W71-08811) (Wray-Chicago)
W71-08814

THE EAST-WEST WATER CONTROVERSY—BOTH SIDES ARE PARTLY RIGHT,
Stanford Univ., Calif.
R. K. Linsley.
Journal of the Sanitary Engineering Division, Proceeding of ASCE, Vol 93, No SA4, p 49-62, Aug 1967.

Descriptors: *Water management, *Planning, *Water resources, Economics, Projects, Downstream, Flood control, Navigation, Irrigation, Costs, Oceans, Deserts, Efficiencies, Hydrology, Conservation, Water pollution control.
Identifiers: Urban water supply, Sub-marginal farming, *Rational basis, Comprehensive planning.

The purposes of this discussion was a concept shared mutually by both the East and the West that the other half of the country was not doing a very good job of water management. It pointed out that we should learn to deal with water development on a completely rational basis and that we lack a coherent and rational national water policy. S

the myths that surround the water problem was scussed. The most important myth that must be oken is that our major goal is the development of r water resources. There are many alternatives ailable to us. Instead of concentrating our search primarily on the structural features of draulic projects and on hydrology, we need to do me research in the area of conservation of water the urban environment or on improving efficien- of water use in agriculture. We need to face uarely the economics of cost-sharing and reim- rsement between federal and local government. /ang-Rutgers)
71-08820

C. Cost Allocation, Cost Sharing, Pricing/Repayment

ATER QUALITY MANAGEMENT AND A OLICY MODEL,
emson Univ., S. C. Dept. of Environmental stems Engineering; and Georgia Inst. of Tech., lanta. School of Industrial and Systems En- eering.
r primary bibliographic entry see Field 05G.
71-08499

RNINGS OF MUNICIPALLY OWNED UTILI- ES IN WISCONSIN,
sconsin Public Service Commission, Madison.
P. Deuel.
rnal American Water Works Association, Vol No 2, p 162-169, Feb 1960. 1 tab, 3 fig.

scriptors: *Utilities, *Profit, Operations, Main- ance, Depreciation, Public utilities, Costs, es, Payment, Revenues, Surveys, Capital, Debt, nstruction costs, Expenditures, Wisconsin.
ntifiers: *Earnings, *Dividends, *Tax ivalent, Disbursements, Stockholders, General d, Current ratio, Liabilities.

ome of a public utility owned by a municipality st first be used for operational, maintenance, preciation, interest, local and school tax ivalents, additions, improvements, and other essary disbursements, and indebtedness. In- ne in excess of these requirements may be used purchase certain specified interest-bearing ds or insurance on the life of an officer or nager of the utility, or may be paid into the eral fund. Payments into the general fund are nparable to dividends paid by a corporation to stockholders. Items discussed included pay- nts for utility service, tax equivalent, depreci- expense, return on rate base, dividends, cur- t ratio, and general fund. Records of several mu- pally owned utilities that usually pay a dividend e studied in order to determine their financial ure and relationship between dividends paid other demands on available funds. (Wang-Rut- s)
1-08817

VENUES, RATES, AND ADVANCE ANNING,
ord, Burdick and Howson, Chicago, Ill.
. Howson.
rnal American Water Works Association, Vol No 2, p 153-161, Feb 1960. 4 fig, 3 ref.

criptors: *Revenues, *Rates, *Costs, Operation maintenance, Depreciation, Growth rates, ancing, Construction, Capital investment, Dept, nmissions, Water quality, *Planning, Iowa.
ntifiers: *Advance planning, *Water utilities, Moines, Capital requirements, Rate schedule, g-term bonds, Reproduction cost.

vance planning of a water utility facilitates the ncing of new construction from current enues and results in a material saving in the cost vater service. Public water supplies must con- e to grow, and the money necessary to finance growth must come from water revenue. The rates for water service should be set well in advance of their effective date and are intended to provide for the future. Future operation and maintenance costs vary greatly and must be considered in fixing future rates. In municipally owned utilities, estimates of the gross revenue requirement are based on: operation and maintenance costs, debt service on obligations outstanding and to be issued in the succeeding 3-5 years, a depreciation allowance, and estimated average annual capital additions for the next 5 years. The utilities could do well to finance construction with less borrowing, simply by more careful planning. (Wang-Rutgers)
W71-08818

6D. Water Demand

CHARACTERISTICS OF HOUSEHOLD WATER CONSUMPTION IN THREE NEW HAMPSHIRE COMMUNITIES,
New Hampshire Univ., Durham. Water Resources Research Center.
Richard A. Andrews, and Martha R. Hammond.
Available from the National Technical Information Service as PB-199 706, $3.00 in paper copy, $0.95 in microfiche. New Hampshire University Water Resources Research Center Research Report No 3, Dec 1970. 21 p, 9 tab, 8 ref. OWRR Project A-018-NH (1).

Descriptors: *Water utilization, *Domestic water, *New Hampshire, *Water users, Water demand, Water costs, Lawns, Utilities, Water management (Applied), Water requirements, Cities.
Identifiers: *Household water consumption.

Water use in 361 households in three communities in southeastern New Hampshire was studied to determine the quantity of water used, causes for variation in quantity, the factors affecting consumption, and the annual household expenditures for water. Water use per household ranged from 8,000 gallons per year to 383,000 gallons per year. The quantity of water used daily per capita ranged from 8 gallons to 263 gallons. Lawn watering was not a major use of water. Households use more water during summer than during winter. Waste water disposal systems (septic tank or community disposal systems) were not a significant determinant of water consumption. There is a fixed 'overhead' quantity of water used, with an incremental use for each additional person of about 30 gallons of water daily. The overhead and the increment are determined by the appliances and fixtures of the house. The influence of the number of persons in the household and the physical characteristics of homes were more useful statistical determinants of water consumption than the single determinant of house value. Household expenditures for water were found to be an insignificant item in family budgets. (Knapp-USGS)
W71-08323

WATER IN THE SERVICE OF MAN,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
D. C. Midgley.
South African Journal of Science, Vol 66, No 11, p 350-358, Nov 1970.

Descriptors: *Hydrological cycle, *Planning, *Consumptive use, *Water properties, *Water users, Water resources development, Irrigation, Cooling, Municipal water, Groundwater, Surface waters, Desalination, Arid lands, Water allocation (Policy), Water vapor, Multiple-purpose projects.
Identifiers: *South Africa.

Both groundwater and surface water are in limited supply in South Africa, and estimates of future use indicate the country is not far from full exploitation of current resources. The hydrological cycle is reviewed and it is shown that when water enters the vapor part of the cycle, it is 'lost' to man. Practically all uses of water entail some conversion to the vapor phase. It therefore follows that a fundamental precept of water planning philosophy in water-short countries should be that water must be diverted to as many uses as possible before being allocated to consumptive uses. This necessitates highly coordinated national multi-use planning. The traditional practice of industrial and power site locations near low cost water for consumptive use must be abandoned. Municipalities use 10-20% of their source water while irrigation and thermal cooling stations use 80-100%. All sectors should therefore be located and coordinated so that waters shared by them are utilized with optimal efficiency. In arid lands, value added from water consumption is 44-51 dollars/acre ft for irrigation, about 250 dollars for recreation and 3000-4000 dollars for industry. Irrigation development in such regions should be avoided, and industrial development encouraged. (Casey-Arizona)
W71-08465

ESTIMATED WATER USE IN NEVADA,
Geological Survey, Carson City, Nev.; and Nevada State Dept. of Conservation and Natural Resources, Carson City.
Thomas J. Smales, and J. R. Harrill.
Nevada Division of Water Resources Planning Report No 2, Jan 1971. 32 p, 6 photo, 16 tab.

Descriptors: *Water utilization, *Nevada, Consumptive use, Withdrawal, Groundwater, Surface waters, Municipal water, Domestic water, Irrigation water, Stock water, Water supply, Water resources development, Water management (Applied), Planning, Water demand.
Identifiers: Nevada, Water Plan.

Withdrawals of water in Nevada from wells, springs, streams and rivers have increased from about 4.1 million acre-feet in 1950 to about 4.6 million ac. ft. in 1969. Use of spring discharge dropped slightly during this period, mainly due to the effects of heavy pumping in Las Vegas and Pahrump Valleys. Stream and river diversions increased from about 3.9 million ac. ft. to about 4.0 million ac. ft., an increase of about 2 1/2 percent. Pumpage from wells has increased by more than ninefold - from 53,000 ac. ft. in 1950 to about 490,000 ac. ft. in 1969. Most future increases will probably be from pumping groundwater. Between 1965-69 annual withdrawals for irrigation increased by less than 1 percent and electric power generation by about 4 percent. By contrast, public supply withdrawal soared by about 45 percent, and self-supplied industrial use by about 25 percent. (Knapp-USGS)
W71-08526

BUILDING RELIABILITY OF PLANT, PEOPLE, AND SERVICE,
Detroit Metropolitan Water Services, Mich.
For primary bibliographic entry see Field 05D.
W71-08816

PROJECTED GROUNDWATER DEFICIENCIES IN NORTHEASTERN ILLINOIS, 1980-2020,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 04B.
W71-08906

6E. Water Law and Institutions

GUIDELINES--WATER QUALITY MANAGEMENT PLANNING.
Environmental Protection Agency, Washington, D.C. Water Quality Office.

Environmental Protection Agency, Water Quality Office, Wash, DC (Jan 1971). 30 p, 3 fig, 5 append.

Descriptors: *Water resources development, *Planning, *Grants, *Standards, Administrative agencies, Programs, Coordination, Economic efficiency, Management, Methodology, River basin development, Waste water treatment, Waste water

(Pollution), Construction costs, Financing, Treatment facilities, Sewage treatment, Long-term planning, short-term planning, Non-structural alternatives, Federal project policy, Federal government, State governments, Local governments, Legal aspects.
Identifiers: Administrative regulations.

During the preparation of unified planning requirements for the Environmental Protection Agency Waste Water Treatment Works Construction Grant Program and the Housing and Urban Development Water and Sewer Facilities Grant Program, these Preliminary Planning Guidelines provide the basic considerations to be addressed in meeting the requirements of both organizations. The guidelines, applicable to planning agencies concerned with development of water quality management plans, delineate the general policies, procedures and requirements for development of the necessary plans, and the evaluation of the effectiveness of the developed plans, in meeting national water quality objectives. Primary emphasis is given to the actions necessary to implement current regulations, appended hereto, on grants for water pollution control. Procedures for the processing and coordination of plans are set forth, along with sample plans and organizational charts. Guidelines for the development of water quality management plans for basins and for metropolitan regional areas are delineated, including the methodology of quality prediction and strategies resulting in cost effective solutions for waste water disposal problems within the planning area. Procedures, criteria and responsibilities for EPA evaluation and acceptance of the plans and construction grant applications are defined and described. (Smiljanich-Florida)
W71-08427

WATER QUALITY CONTROL IN CALIFORNIA: A REGIONAL APPROACH,
Richard N. Schwartz.
California, Western Law Review, Vol 7, No 1, p 138-160 (1970). 23 p, 136 ref.

Descriptors: *California, *Water quality control, *Regional analysis, *Water pollution control, Administration, Water management (Applied), Water quality, Water requirement, Supervisory control (Power), Pollution abatement, Local governments, Long-term planning, Integrated control measures, Water districts, Sewage districts, State jurisdiction, Non-structural alternatives, Political aspects, Regulation, Project planning, Legislation, Legal aspects.

Examined in this note are the difficulties confronting California's regional water quality control boards implementing regional water quality plans. Organizational structure, plan formulation, and enforcement procedures under current law are emphasized. Each of California's nine regional boards represents a major watershed. Regional planning establishes the following elements: (1) protected beneficial uses, (2) water quality objectives, and (3) implementation programs. Regional policy is implemented in a two-step process: (1) implementation of waste discharge requirements, and (2) imposition of legal sanctions enforcing discharge requirements. This reliance on abatement rather than preventative enforcement has rendered the multi-community approach adopted in one region ineffective. It has been suggested that regional boards be statutorily granted the authority to institute the consolidation, dissolution, or reorganization of sewerage districts. This would allow inter-community coordinated waste disposal and more effective long-range water quality planning. Current statutory prohibitions upon board power to specify the means of waste discharge compliance is warranted. Allowing direct regional water quality control through sewerage district reorganization would make California's water quality system far more effective. (Earl-Florida)
W71-08428

A BILL TO AMEND THE CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FOR STANDARDS FOR THE MANUFACTURE OF CERTAIN PRODUCTS TO PROTECT THE QUALITY OF THE NATION'S AIR AND NAVIGABLE WATERS.
Senate Bill 573, 92d Cong, 1st Sess (1971). 20 p.

Descriptors: *Industrial production, *Pollutant identification, *Water pollution control, *Legislation, Legal aspects, Federal jurisdiction, Federal government, Water pollution sources, Chemical wastes, Non-structural alternatives, Industrial wastes, Organic compounds, Institutional constraints, Navigable waters, Water quality control, Administrative agencies, Administrative decisions, Environmental effects, Analytical techniques, Path of pollutants, Toxins, Supervisory control (Power), Standards, Regulation, Air pollution.
Identifiers: *Federal Water Pollution Control Act, *Clean Air Act.

Authorizing the implementation of standards for substances utilized in manufacturing processes, this bill would amend both the Federal Water Pollution Control Act and the Clean Air Act. The bill's purpose is the protection of the nation's air and navigable waters. The Administrator of the Environmental Protection Agency is required to designate substances used in manufacturing which adversely affect public health or violate air or water quality standards. Prior to the introduction of any previously unused manufacturing substance, the manufacturer would be required to: (1) provide the name, concentration, purpose, and chemical composition of such substance; (2) conduct health tests; (3) supply all available information relating to environmental effects of the substance; and (4) describe techniques for detecting such substance. The Administrator would prescribe utilization standards whenever a substance might result in adverse discharges into the air or navigable waters. Such standards must include testing techniques and reporting requirements. The manufacture, import, or export of products not conforming to promulgated standards would be unlawful. Products which fail to conform to appropriate standards would be subject to libel, seizure, and condemnation. Judicial procedures, including criminal contempt and injunctive measures, would be governed by procedures set forth in the bill. (Earl-Florida)
W71-08429

CALIFORNIA'S TIDELAND TRUST: SHORING IT UP,
Peter C. Davis.
Hastings Law Journal, Vol 22, No 3, p 759-781 (1971). 23 p, 160 ref.

Descriptors: *California, *Coasts, *Land use, *Environmental effects, Beds, Ownership of beds, Public rights, Public benefits, Wetlands, Tidal marshes, Tidal waters, Coastal marshes, Shores, Water resources development, Human population, Administration, Damage, Balance of nature, Ecology, Exploitation, Community development, Preferences (Water rights), Legal aspects, Legislation, Judicial decisions.

Traditionally limited to promoting commercial, fishing, and navigational interests, California's tidelands trust is explored in this article as a vehicle to protect tideland ecological integrity. The public trust doctrine evolved through Roman, English, and American law. The development of the trust in California resulted from legislative actions and judicial construction. The terms of the trust are analyzed and set forth in eleven points by the author. Enforcement of the trust by both the state and private citizens is examined. Historically, trust administration has been characterized by an ecologically unsound promotion of commercial interests. Precedent exists for reappraising the trust's 'public interest' concept in terms of environmental quality. Recent California legislation should provide the courts with a mandate for such a reappraisal. A new approach is needed to put commercial tideland projects into perspective. Environmental advocates will attempt to expand the trust. If the courts listen, the legacy of past ecological abuse need not be accepted in the future. (Earl-Florida)
W71-08430

FIRST ANNUAL REPORT ON THE STATE OF THE NATION'S ENVIRONMENT--MESSAGE FROM THE PRESIDENT OF THE UNITED STATES,
Richard M. Nixon.
117 Cong Rec 505-512 (daily ed Feb 18, 1971). 8 p.

Descriptors: *Environment, *United States, *Water pollution control, *Non-structural alternatives, Federal government, Planning, Administrative agencies, State governments, Local governments, Water pollution, Pollutants, Pollution abatement, Air pollution, Land use, Land resources, Water resources, Water resources development, Parks, Recreation, Water pollution sources, Taxes, Ecology, Federal project policy, Pesticides, Legislation.
Identifiers: *Presidental messages.

This President's Report on the State of the Environment is divided into six parts. Part One considers strengthening of pollution control programs and proposes corrective measures including charges on sulfur oxides and leaded gasoline, water pollution controls, pesticide control authority, and a federal procurement program for paper recycling. 'Controlling Emerging Problems' is the topic of part two, which proposes regulation of toxic substances, regulation of noise pollution, and controls on ocean dumping. To promote environmental quality in land use decisions, the President proposes in part three: (1) a national land use policy; (2) an open space and recreational program bringing parks to urban areas; (3) preservation of historic buildings through tax policy; (4) expansion of the wilderness areas preservation system; (5) public agency approval of power transmission line routes; and (6) mining regulations. In part four, expanded international cooperation and a world heritage trust are proposed. Establishment of an environmental institute is recommended in part five. In part six, the role of the individual citizen in improving the environment is stressed. (Harris-Florida)
W71-08431

A BILL TO PRESERVE AND PROMOTE THE RESOURCES OF THE CONNECTICUT RIVER VALLEY.
Senate Bill 36, 92d Cong, 1st Sess (1971). 14 p.

Descriptors: *Connecticut, *Legislation, *National historic parks, *National recreation areas, Vermont, New Hampshire, Massachusetts, Federal government, State governments, Local governments, Administration, Regulation, Administrative agencies, National parks, Public lands, Federal reservations, Recreation, Conservation, Ecology, Rivers, Interstate rivers, River basins, Compensation, Condemnation value, Land tenure, Legal aspects.

The Connecticut Historic Riverway would be established by this proposed bill. Under the bill, the United States shall preserve the natural ecological environment of the Connecticut River Valley Corridor, develop the recreational potential of the area, and encourage maximum complementary action by state and local governments and private individuals, groups and associations. The bill provides for the acquisition of title to lands and scenic easements. Provisions for the taking of private land as well as the rights of the private holders are specified. Regulations shall be issued to carry out the provisions of this bill, but such regulations shall not discourage the constructive development and use of land for industrial and commercial purposes which are consistent with the purposes

this bill. The duties and responsibilities of the Secretary of the Interior, Federal Power Commission, National Park Service, Secretary of Agriculture, and Secretary of the Army are detailed. The Connecticut Historic Riverway Advisory Committee is established by the bill, and its membership is explained. (Robinson-Florida)
W71-08432

A BILL TO AMEND THE ACT OF MARCH 3, 1899, RELATING TO PENALTIES FOR WRONGFUL DEPOSIT OF CERTAIN REFUSE, INJURY TO HARBOR IMPROVEMENTS, AND OBSTRUCTION OF NAVIGABLE WATERS.
Senate Bill 679, 92d Cong, 1st Sess (1971). 2 p.

Descriptors: *Coastal structures, *Engineering structures, *Legislation, *Federal government, Coastal engineering, Financing, Rivers, Harbors, Legal aspects, Public rights, Public benefits, Federal jurisdiction, Water policy, Damages, Wastes, Waste disposal, Waste dumps.

Section 16 of the Act entitled 'An Act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes' (33 USC 411) shall be amended by striking out in the first sentence thereof the following: 'twenty-five hundred dollars nor less than five hundred dollars', and adding in lieu thereof '$100,000', and by placing immediately after this first sentence the following new sentence: 'In the case of any violation which continues over a period of time, each day such violation continues shall be a separate violation for the purposes of this section.' (Robinson-Florida)
W71-08433

A BILL TO PROVIDE THAT STATE LAWS OR REGULATIONS WITH RESPECT TO CERTAIN ENVIRONMENTAL MATTERS SHALL NOT BE PREEMPTED OR NULLIFIED BY FEDERAL LAW.
Senate Bill 675, 92 Cong, 1st Sess (1971). 1 p.

Descriptors: *Environment, *Water pollution, *Water pollution control, *Legislation, Air pollution, Legal aspects, Federal government, State governments, Local governments, Regulation, Water law, Pesticides, Herbicides, Waste disposal, Wastes.

Under this proposed legislation no provision of federal law shall preempt or nullify any state law, local ordinance, or regulation for the prevention or regulation of air or water pollution, noise, the use of pesticides or herbicides, or the disposal of solid waste until such time as regulations in lieu of such state law or regulation are put into effect by or pursuant to federal law. (Robinson-Florida)
W71-08434

VIOLATIONS OF LAWS PROTECTING NAVIGABLE WATERS.
Corps of Engineers, Washington, D.C.

33 Code of Federal Regulations, Sec 209.170 (1970). 5 p.

Descriptors: *Rivers and Harbors Act, *Navigation, *Administration, *Navigable waters, Legal aspects, Legislation, Hazards, Accidents, Ships, Harbors, Adoption of practices, Water quality control, Water pollution control, Pollution abatement, Pollutant identification, Abatement, Water quality, Administrative agencies, Supervisory control (Power), Tidal waters, Structures, Construction, Waste disposal, Regulation, Federal jurisdiction.
Identifiers: Administrative regulations.

The substance, enforcement procedures, and penalties for violation of statutes protecting navigable waters are herein outlined. Constructing structures over or in navigable waters requires local permission and Corps of Engineer plan approval. Department of Transportation approval is required for bridges and causeways. The Secretary of the Army's navigational authority extends to artificial islands and outer continental shelf structures. Statutes governing wrecks in navigable waters forbid such activities as: (1) obstructing navigable channels, (2) permitting or causing vessels to be sunk in navigable waters, and (3) the floatation of certain materials in navigated channels. Owners of sunken vessels are required to properly mark such craft. Willful or negligent actions causing vessels to be sunk constitute a misdemeanor. Injury to government works related to navigation is prohibited. The discharge or deposit of refuse matter into or on the banks of navigable waters, tributaries thereof, or certain tidal waters is forbidden. Penalties and enforcement procedures provided in statutes protecting navigation are herein detailed. District Engineers will note and secure enforcement of violations in his district. Such matters will be referred to the Chief of Engineers where parties deny or continue violations. (Earl-Florida)
W71-08435

OPERATION AND MAINTENANCE OF BEAR CREEK DAM AND RESERVOIR.

Code of Federal Regulations, Title 33, Ch 2, Sec 208.31 (1970). 2 p, 1 tab.

Descriptors: *Missouri, *Dams, *Reservoirs, *Reservoir operation, Reservoir storage, Water resources development, Projects, Regulations, Maintenance, Flood control, Flood damage, Water Levels, Water level fluctuations, Water management (Applied), Recreation, Water conservation, Federal government, Cities, Spillways, Engineering structures, Construction, Streams, Streamflow, Discharge (Water).

Having completed the Bear Creek dam and reservoir project in Missouri, the United States Army Corps of Engineers turned it over to the city of Hannibal, Missouri, to be operated and maintained through a superintendent employed by the city in accordance with this regulation. In order to control floods, water levels are prescribed. Water may not be stored to create or maintain a conservation or recreation pool. The superintendent shall regulate the reservoir so as to reduce as much as possible flood damage below the reservoir. The regulation prescribes in what situations water may be released from the reservoir. The superintendent shall operate and maintain the reservoir in accordance with the Corps' manual. He shall furnish the District Engineer with reports on the operation and condition of the dam and with hydrological data as called for. A table prescribes water elevations for the reservoir. The regulations are subjected to temporary modification by the District Engineer in time of emergency. (Duss-Florida)
W71-08436

SANTA BARBARA CHANNEL OIL LEASES,
Richard Nixon.
116 Cong Rec H 5439 (daily ed), 6 US Code Cong and Admin News, p 1950-1951 (1970). 2 p.

Descriptors: *California, *Water pollution sources, *Wildlife conservation, *Oil industry, Oily water, Pacific Ocean, Channels, Sea water, Legislation, Leases, Oil wells, Exploration, Oil, Oil fields, Drilling, Oil reservoirs, Exploitation, Marine geology, Oceans, Water pollution, Aquatic environment, Pollution abatement, Wildlife management, Federal government, Legal aspects.
Identifiers: Oil leases, Presidential messages.

The President of the United States herein submits to Congress a special message requesting legislation to terminate oil exploration leases in the Santa Barbara Channel and to create a marine sanctuary. The State of California had attempted to protect a part of its coastline by creating a state sanctuary and closing it to all petroleum exploration. The federal government, however, subsequently issued leases for petroleum exploration immediately seaward from the state sanctuary. A blowout in the Channel resulted in widespread oil pollution of the sanctuary. Legislation being submitted would terminate all but three leases and create a marine sanctuary. The continuation of the three leases is necessary to avoid further marine pollution as high pressure oil would escape through zones of structural weaknesses if not bled off. These leases would continue under strict management controls. This recommendation is based on the belief that immediate economic gains are outweighed by considerations of wildlife preservation and the quality of life in America. (Smiljanich-Florida)
W71-08437

AN ACT RELATING TO THE ESTABLISHMENT AND IMPLEMENTATION OF PUBLICLY FINANCED EROSION CONTROL AND BEACH RESTORATION PROJECTS.

Florida Laws Ch 70-276, p 869-876 (1970).

Descriptors: *Florida, *Beach erosion, *Boundaries (Property), *Erosion control, Beaches, Riparian land, Beds, Beds under water, Relative rights, Shore protection, Washouts, Real property, Land tenure, Riparian rights, Priorities, Coastal engineering, Administration, Administrative decisions, Adoption of practices, Ownership of beds, Tidal effects, Land management, Administrative agencies, State governments, Legislation, Legal aspects.

Publicly financed beach nourishment and restoration programs are hereby declared to be in the public interest. Upon request for such programs, the Trustees of the Internal Improvement Fund shall require the Department of Natural Resources' approval or disapproval. In determining project priority, the Trustees shall consider relative needs, equipment availability, and federal and local contributions and cooperation. The Trustees shall conduct a survey establishing the restoration area and an erosion control line. No control lines shall be established absent the consent of a majority of affected riparian owners. To receive evidence as to the merit of a project, the Trustees shall, after notice, hold a public hearing. On motion of aggrieved persons, Trustee decisions shall be judicially reviewable. Title to lands seaward of the erosion control line shall be deemed in the state upon the filing of the Trustee's resolution and recording of the erosion control line. Common law principles shall not subsequently alter upland property proportions, but persons divested of riparian title shall continue to enjoy all other riparian rights. Under conditions herein specified projects may be cancelled and established erosion control lines may be voided. (Earl-Florida)
W71-08438

AN ACT TO PROVIDE THAT A RIPARIAN OWNER SHALL CONSENT BEFORE DREDGING MAY BE DONE FOR A PUBLIC PURPOSE.
Florida Laws Ch 70-147, p 497-498 (1970) amending Fla Stat sec 253.12 (5). 2 p.

Descriptors: *Florida, *Riparian land, *Riparian waters, *Dredging, Real property, Land tenure, Relative rights, Riparian rights, Navigable waters, Riparian water loss, State governments, Local governments, Eminent domain, Construction, Public rights, Earthworks, Channel improvement, Excavation, Beaches, Erosion control, Beach erosion, Legal aspects, Legislation, Constraints, Drainage programs.

An amendment to an existing chapter of legislation, this act provides that nothing in the chapter shall be construed to permit any state agency, county, city, or political subdivision to conduct construction or extension operations on lands bordering or in navigable waters, nor to drain such waters, unless such agency is or holds the written consent of the upland riparian owner as herein defined. However, nothing in this amendment shall limit the right of eminent domain concerning such projects. This

amendment shall not be applicable where the Trustees of the Internal Improvement Fund are authorized to establish erosion control lines to implement beach nourishment, replenishment, or erosion control programs. (Earl-Florida)
W71-08439

AN ACT ESTABLISHING THE FLORIDA ENVIRONMENTAL INVENTORY COUNCIL.
Florida Laws ch 70-316, p 945-949 (1970).

Descriptors: *Florida, *Resource allocation, *Ecological distribution, *Administrative agencies, Legislation, Water resources, Land resources, Natural resources, State governments, Wildlife, Grasslands, Forests, Conservation, Resources, Resource development, Soil conservation, Inspection, Environments, Administration, Coordination, Evaluation, Animal populations, Aquatic life, Beaches, Census, Plant populations.

The Florida Environmental Inventory Council is hereby created as an advisory council to the Department of Natural Resources. The Council's membership shall consist of the administrative heads of: (1) the departments of Commerce, Transportation, Health, and Rehabilitative Services, Air and Water Pollution Control, Agriculture and Consumer Services, Administration, and Natural Resources; (2) the Public Service Commission, Game and Fresh Water Fish Commission, and Trustees of the Internal Improvement Trust Fund; and (3) five citizens nominated by the governor. It is the intent of the legislature to create the Council for a three-year period to advise the Department concerning an environmental inventory of Florida's natural resources. Under authority herein detailed, the Department shall develop and conduct such an inventory containing a statement of present resource use and affected environmental factors. Included in coastal area inventories shall be: (1) submerged or exposed, grassy productive areas; (2) algae-covered areas; (3) salt-loving plants; (4) estuarine areas; (5) salt water aquatic life; and (6) beach topography and stability. Watershed quality, stream circulation, and fresh water aquatic life shall be included in inland water inventories. Included in inland inventories shall also be: natural vegetation areas, soil quality and stability, and wildlife. (Earl-Florida)
W71-08440

THE FLORIDA WATER POLLUTION CONTROL AND SEWAGE TREATMENT PLANT GRANT ACT OF 1970.
Florida Laws ch 70-251, p 769-775 (1970).

Descriptors: *Florida, *Water pollution control, *Treatment facilities, *Grants, Water pollution treatment, Waste treatment, Sewage treatment, Sewage disposal, Sewage, Sewage districts, Local governments, State governments, Federal government, Legislation, Legal aspects, Project planning, Water quality control, Adoption of practices, Administrative agencies, Payment, Administration, Financing construction costs, Capital costs, Cost sharing.

The Florida Water Pollution Control Trust Fund is hereby established to be used for grants to local governmental agencies for sewage treatment facility construction. The Florida Air and Water Pollution Control Board shall implement this act and administer appropriated funds. Grants shall be made only to projects eligible for federal grants. No grants shall be made unless a facility is approved by, and subject to, Board-imposed conditions. The local agency must agree to pay costs exceeding state and federal grants. Grants shall not exceed 25% of costs eligible for federal grants. The local agency must adopt and submit for approval a comprehensive long-range water pollution control plan. This plant shall: (1) provide for construction preventing inadequately treated waste discharge; (2) provide planning, zoning, population projection, engineering, and economic studies; (3) comply with the state population control plan; (4) set forth timing, financing, construction, and operating proposals; and (5) be reviewed by local planners. The Board may administer planning grants and provide coordinating technical assistance. Projects shall be funded in order of priorities established by the Board. The Board may advance funds equal to approved, but not yet available, federal grants. (Earl-Florida)
W71-08441

AN ACT AUTHORIZING DRAINAGE, WATERSHED IMPROVEMENT, AND SOIL CONSERVATION DISTRICTS TO ENTER INTO AGREEMENTS WITH THE UNITED STATES FOR THE CONTRACTING OF IMPROVEMENT WORKS.
Act 152, Acts of Arkansas, p 440-443 (1969). 4 p.

Descriptors: *Arkansas, *Water districts, *Contracts, *Construction, Drainage districts, Watershed management, Soil conservation, Bids, Institutional constraints, Projects, Federal government, United States, Construction costs, Engineering structures, Administrative agencies, Legislation, State governments, Legal aspects.

Three prior acts are hereby amended to authorize drainage districts, watershed improvement districts, and soil conservation districts to enter into contracts with the United States for the construction of improvement works and awarding of contracts therefor. The construction of the improvements and the awarding of contracts are to be by, and under the control and supervision of, the United States or any of its agencies. The advertisement, award, and carrying out of the contracts shall be in accordance with the applicable federal agency laws. (Smiljanich-Florida)
W71-08442

POLITICS OF WATER,
Colorado State Univ., Fort Collins. Dept. of Political Science.
Philip O. Foss.
Presented at an international symposium, 'Arid Lands in a Changing World,' Tucson, Arizona, June 1969. In: Arid Lands in Transition, Dregne, H E (ed), Pub No 90, AAAS, p 165-173, 1970. 4 ref.

Descriptors: *Political aspects, *Social impact, *Water law, *Water policy, Water resources development, Decision making, Water rights, Environmental effects, Social values, Institutions, Political constraints.
Identifiers: *Oases.

The populations of arid lands may be divided into 2 major groups: (1) a small diffuse rural population, diminishing in both size and importance in most nations; (2) concentrated oasis populations, usually rapidly growing, which control national politics. In areas of water scarcity, water may be allocated through the use of force, the market system, or the political system. Though often camouflaged, force is used extensively. Because of the necessity of high risk capital and limited profits the market system is inefficient and usually gives way to political allocation. Rapid growth of oasis communities, intensification of the problems of population concentration, and development of new uses for water--all significant environmental changes associated with an affluent society--will inevitably create further demands on such a political water system responsive to economic growth forces and demands for protection of existing rights. (Casey-Arizona)
W71-08452

FLORIDA AQUATIC WEED CONTROL ACT.

Fla Laws ch 70-203, p 613-616 (1970) 4 p.

Descriptors: *Florida, *Aquatic weeds, *Water pollution control, *Aquatic plants, Legislation, Public health, Recreation, Water hyacinth, Administrative agencies, Research facilities, Financing, Costs, United States, Natural resources, Water resources development, Permits.

Authorizing the Florida Department of Natural Resources to direct state activities relating to aquatic plant control, this Act and amendments to existing Florida statutes outline the department's duties and provide for coordination with other administrative agencies. The basic public policy is to vest authority for aquatic plant control in the Department so as to protect human health, safety, and recreation and to as far as possible prevent injury to plant and animal life and property. It is the Department's duty to coordinate the aquatic weed control activities of all public agencies. It may delegate these functions to the Division of Game and Fresh Water Fish. The Department shall also have responsibility for promoting, developing, and supporting research activities relating to aquatic plant control. The Department's powers in this area are outlined. The Act also delineates the procedure whereby the Department may disburse funds to local agencies for aquatic plant control. An amendment to the Florida statute on hyacinth control gives the Florida Game and Fresh Water Fish Commission the authority to cooperate with the United States with respect to hyacinth eradication, subject to the rules and regulations of the Department. (Duss-Florida)
W71-08502

METROPOLITAN WATER MANAGEMENT CASE STUDIES AND NATIONAL POLICY IMPLICATIONS.
Urban Systems Research and Engineering, Inc., Cambridge, Mass.
For primary bibliographic entry see Field 06B.
W71-08516

A CONSIDERATION OF FEDERAL FINANCIAL INCENTIVES TO INDUSTRY FOR ABATING WATER POLLUTION.
League of Women Voters, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-08529

A BILL TO AMEND THE FEDERAL DISASTER ACT TO PROVIDE ASSISTANCE FOR THE REHABILITATION AND RECONSTRUCTION OF AREAS DAMAGED BY FLOODS AND HIGH WATERS.

Senate Bill 1793, 89th Cong, 1st Sess (1965).

Descriptors: *Floods, *Flood damages, *Compensation, *Disasters, Government finance, Flood water, Flood protection, Water injury, Damage, Water level fluctuations, Property values, Land reclamation, Rehabilitation, Construction, Grants, Financing, Debt, Loans, Projects, Urban renewal, Flood plain insurance, Insurance, Administrative agencies, Federal government, Legislation, Legal aspects.
Identifiers: *Federal Disaster Act.

In response to extensive property loss and severe damage often resulting from floods and high waters, the Federal Disaster Act would be amended by this proposed legislation to provide assistance for the rehabilitation and reconstruction of damaged areas. Federal-aid highway systems damaged by floods and high waters would be repaired or reconstructed with federal money. The Secretary of Agriculture would be authorized to compromise or release borrower indebtedness under various administrative programs as he finds necessary because of losses resulting from floods and high waters. The Housing and Home Finance Administrator would also be authorized to compromise or release specified indebtedness. He could issue urban renewal project grants for reconstruction and redevelopment of damaged land. Other necessary civil works projects by the Corps of Engineers would be authorized by the Act. Provisions would be made for federal assistance to states for the retiring or adjustment of private mortgage obligations. Regulative provisions under the Act would take into consideration the reasonable foreseeability of loss by floods or high waters in the affected areas, the availability and presen

demnification, and the applicant's failure to take lequate precautions against the damage. (Smil-nich-Florida)
71-08563

BILL TO AMEND THE OIL POLLUTION CT TO IMPLEMENT THE PROVISIONS OF HE INTERNATIONAL CONVENTION FOR HE PREVENTION OF THE POLLUTION OF HE SEA BY OIL.

nate Bill 2017, 89th Cong, 1st Sess (1965).

escriptors: *International waters, *Waste posal, *Ships, *Oily water, Oil, Oil wastes, ater pollution sources, Water pollution, Waste mps, Pollution abatement, Pollutants, Water pol-ion control, Water quality control, International , Oil industry, Treaties, Federal government, gislation, Legal aspects.

order to implement the provisions of the Interna-nal Convention for the Prevention of the Pollu-n of the Sea by Oil, the Oil Pollution Act of 1961 uld be amended in several respects by this posed legislation. The definitions of the terms ' and 'ship' would include specified distinctions d certain ships would be expected from the visions of the Act. A new provision would incor-rate the definition of the term 'from the nearest d' as defined in the Convention. Under the Act, amended, the discharge of oil or oily mixture m specified ships and tankers would be hibited or subject to prescribed regulations. rtain discharges, however, would be excepted m the prohibition. The zone of prohibition uld include all sea areas within fifty miles from nearest land, subject to extensions or reduc-ns effectuated in accordance with the terms of Convention. Provisions would be made for the intenance of oil record books by every ship and ker subject to the Act. Such books would con-detailed records of any discharge of oily water. niljanich-Florida)
1-08578

CRETION AND RECLAMATION.

Florida Real Estate Law and Procedure, The rrison Company, Atlanta, p 1595-1616 (1960). p, 45 ref.

scriptors: *Florida, *Accretion (Legal aspects), nk erosion, *Avulsion, Riparian rights, Ripari-land, Riparian waters, Boundaries (Property), ndary disputes, High water mark, Navigation, igable waters, Streams, Rivers, Ownership of s, Land tenure, Real property, Bulkhead, Land-, Bulkhead line, Legislation, State governments, al aspects.

following terms are defined in the first section his article dealing with accretion and reclama-: (1) accretions, (2) alluvion, (3) reliction, (4) lsion, and (5) erosion. The second section, enti-'accretions and relictions', considers the title oil formed or exposed by the natural action of water or by receding waters. The common law is expressed and stated to be applicable in rida. Whether title to accretions or relictions ses in a conveyance of the riparian tract is ussed. Several Florida decisions which are par-larly applicable to the doctrine of accretions relictions are analyzed. Whether the cause of retion or reliction affects the general rules is discussed. The remaining section considers the amation of riparian land. Provisions of state slation permitting bulkheads and fills are exten-ly discussed, along with the rights of contiguous rian owners. Also, decisions construing provi-s of the applicable statute are analyzed. (Hart-rida)
1-08596

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JAW ISLAND FREIGHT AND TERMINAL V CITY OF BUFFALO (PRIOR NOTICE REQUIREMENT FOR POLLUTION SUIT AGAINST CITY).
133 Misc 64, 231 NYS 139-145 (Sup Ct 1928).

Descriptors: *New York, *Sewage, *Water pollution, *Adjudication procedure, Water pollution sources, Rivers, Damages, Sewers, Overflow, sands, Gravels, Islands, Land, Land tenure, Cities, Sewage disposal, Legal aspects, Judicial decisions.

Plaintiff sand and gravel company sought to restrain defendant city from continuing to discharge sewage into a river. Plaintiff also sought to recover for damages to plaintiff's property caused by the sewage already discharged by defendant. Plaintiff owned land on an island from which it took sand and gravel. It alleged that defendant's sewage had formed a margin around the island and also covered the surface of the island, thereby rendering the sand resources worthless. Defendant contended that plaintiff had not followed the requisite procedure for suing the city in that the city charter required that no action on a claim could be brought against the city until the expiration of forty days after the filing of the claim with the city council. The supreme court agreed with defendant's contention and dismissed plaintiff's complaint without predjudice. (Duss-Florida)
W71-08602

ROSSI V CITY OF SCHENECTADY (CONDITIONS PRECEDENT TO SUIT AGAINST MUNICIPALITY FOR FAULTY SEWERS).
133 Misc 792, 233 NYS 512-515 (Sup Ct 1929).

Descriptors: *New York, *Flood damage, *Storm drains, *Adjudication procedure, Local governments, Sewers, Sewage, Floods, Floodwater, Surface runoff, Surface waters, Surface drainage, Damages, Storm runoff, Water injury, Legislation, Judicial decisions, Legal aspects.

Plaintiff resident sought damages from defendant municipality after sewer back up and overflow flooded plaintiff's premises. Plaintiff timely filed a statutorily required notice of claim stating his residence and that the faulty sewer was 'in said vicinity.' Plaintiff contended the defendant had negligently constructed the sewer. Defendant moved for dismissal, alleging plaintiff's notice had failed to explicitly describe the faulty sewer's location and, therefore, did not meet the statutory condition precedent to suit. The Supreme Court, Schenectady County, held that a description enabling municipal authorities to determine, with reasonable diligence, the location of a defective sewer, suffices to meet statutory requirements of notice prior to suit. Plaintiff's description of residence coupled with a statement alleging negligence in the backing up of sewers 'in said vicinity' provided defendant with adequate notice of the plaintiff's claim. Defendant's motion to dismiss was denied absent any claim of misrepresentation. (Earl-Florida)
W71-08606

STACK V CITY OF NEW YORK (MUNICIPAL AND PRIVATE LIABILITY FOR SEWAGE OVERFLOW).
134 Misc 105, 234 NYS 486-489 (NY City Ct 1929).

Descriptors: *New York, *Flood damage, *Storm drains, *Sewers, Storm runoff, Cloudbursts, Overflow, Rain water, Surface runoff, Floods, Drainage system, Drainage system, Drainage practices, Drainage water, Drainage, Damages, Local governments, Real property, Land tenure, Historic flood, Cities, Legal aspects, Judicial decisions, Sewerage.

Plaintiff tenant sought damages from defendant landlord and from defendant city for losses incurred when a sewer overflow flooded her premises. The street abutting plaintiff's residence contained both a sanitary sewer and a rainwater drainpipe. During an extraordinary rainfall, water flowed over the gutter and into plaintiff's residence. Plaintiff contended defendant landlord knowingly maintained the premises below street level and that defendant city had negligently failed to provide an adequate drainage system. The City Court of New York held that: (1) absent fraud or express warranties, no cause of action against a landlord arises from flood damage to premises below the street grade; and (2) a city in constructing sewers is not bound to provide for extraordinary rainfalls and is not liable when, after such rainfalls, sewers back up and flood private premises. The court noted that plaintiff had failed to establish that sewage came onto the premises or that the drainpipe had been improperly constructed or maintained. Ruling that plaintiff had failed to state a cause of action against the landlord or establish the city's negligence, the court granted verdict for defendants. (Earl-Florida)
W71-08612

SMITH V VILLAGE OF VICTOR (OBSTRUCTING CULVERT AS NUISANCE OR NEGLIGENCE).
134 Misc 888, 236 NYS 566-570 (Sup Ct 1929).

Descriptors: *New York, *Culverts, *Obstruction to flow, *Adjudication procedure, Flood damage, Highways, Streams, Cities, Maintenance, Flow, Overflow, Construction, Land, Land tenure, Damages, Legal aspects, Judicial decisions, Surface runoff.

Plaintiff sought to recover from defendant village for flood damages to his building. The flooding was caused by a clogged culvert maintained by defendant. Plaintiff alleged that the creation and maintenance of this condition amounted to a nuisance and that his damages were sustained by reason of the nuisance. Defendant moved to dismiss on the ground that defendant's action was based on negligence and that village law prohibited negligence suits against the village unless a written, verified statement of the claim was filed in the village within thirty days after the cause of action accrued. The trial court granted defendant's motion. It was the village's duty to maintain the culvert which became obstructed. However, plaintiff's action was grounded in negligence. Therefore, he was required to comply with the village law regarding filing a statement of claim. At best, plaintiff's action was a nuisance action based on negligence, and, as such, the notice rules applicable to negligence would be applied. (Duss-Florida)
W71-08621

CITY OF THOMSON V MCCORKLE (DAMAGES CAUSED BY OVERFLOW OF DRAINAGE SYSTEM).
171 SE 186-187 (Ct App Ga 1933).

Descriptors: *Georgia, *Drainage systems, *Overflow, *Adjudication procedure, Obstruction to flow, Drains, Drainage, Surface drainage, Surface waters, Rainfall, Cities, Surface runoff, Damages, Legal aspects, Judicial decisions.

Plaintiff property owner sued defendant city to recover damages caused by an overflow of water from defendant's drainage system. Plaintiff in his first petition alleged that defendant's negligent 'maintenance' of the drainage system caused the overflow and plaintiff's damages. Later, plaintiff amended this first petition to allege that defendant had negligently allowed the drainage system to become clogged. In so amending the petition, plaintiff omitted the earlier allegation of negligent maintenance. Defendant at trial attempted to enter the fact of such omission into evidence against plaintiff. The trial court refused to admit such evidence, a verdict was rendered for plaintiff, and defendant appealed on the ground that it was error to reject this evidence and to accept certain other evidence. The Court of Appeals of Georgia reversed. It was error to reject evidence of the stricken allegations. Such evidence would properly tend to show an admission by plaintiff that damage was caused by the inadequate construction of the

drainage system and not by an obstruction of the drains. However, it was not error to admit, in support of showing the condition at the time of the overflow, evidence showing the condition of the drains after the overflow. (Duss-Florida)
W71-08627

HILL V CITY OF WINTERSET (DAMAGES FOR CITY'S MAINTENANCE OF NUISANCE).
214 NW 592-593 (Iowa 1927).

Descriptors: *Iowa, *Sewage, *Water pollution, *Adjudication procedure, Sewers, Ditches, Cities, Septic tanks, Cesspools, Drainage, Construction, Discharge (Water), Watercourses (Legal), Storm drains, Odor, Public health, Judicial decisions, Legal aspects, Damages, Relative rights, Legislation.

Plaintiff landowner brought suit against defendant city to recover damages for maintenance of a nuisance. Defendant had constructed a storm sewer along a public street adjacent to plaintiff's property, and this sewer discharged into an open ditch near plaintiff's premises. Defendant also connected drains from septic tanks and cesspools to the storm sewer, thereby causing the discharge to become offensive and obnoxious. Plaintiff's complaint was based on the offensive nature of this nuisance. Plaintiff received a verdict and defendant appealed. The Supreme Court of Iowa affirmed. The statute under which the action was brought was sufficiently broad to allow introduction of evidence concerning the health hazards of the nuisance, even though plaintiff's claim was based on the obnoxious odors caused by the nuisance. Portions of the evidence regarding sanitary aspects in the utilization of septic tanks were immaterial but were not prejudicial to defendant's case. (Duss-Florida)
W71-08678

STOVERN V TOWN OF CALMAR (MEASURE OF WATER POLLUTION DAMAGES TO LESSOR OF RIPARIAN LAND).
216 NW 112-115 (Iowa 1927).

Descriptors: *Iowa, *Water pollution, *Leases, *Remedies, Pollution abatement, Reasonable use, Riparian rights, Treatment facilities, Water pollution effects, Odor, Municipal wastes, Damages, Sewage, Sewage disposal, Sewage treatment, Rent, Land tenure, Riparian land, Evaluation, Local governments, Cities, Judicial decisions, Legal aspects.

Plaintiff landlord sued defendant city to enjoin a nuisance and to recover damages. Plaintiff contended that defendant dumped sewage into a stream bordering plaintiff's property, thereby causing him injury in the amount of reduced rental value to a tenant leasing the land. Defendant contended that an injunction was not appropriate as the city had begun construction of a sewage disposal plant. Defendant also contended that plaintiff could not use reduced rental value of the land as his measure of damages because such damages were for injury to the right of occupancy and comfortable enjoyment of the premises, which belonged only to the tenant. The Supreme Court of Iowa affirmed the lower court judgment awarding damages to plaintiff, but remanded the granting of an injunction for further taking of evidence. The court noted that the nuisance had commenced prior to plaintiff's leasing of the property. Where a nuisance is in existence at the time when land is leased by the owner and such nuisance depreciates the rental value of the property, the owner may recover, among other items, damages for the amount of the reduced rental value. (Smiljanich-Florida)
W71-08689

STOVERN V TOWN OF CALMAR (ABATEMENT OF WATER POLLUTION NUISANCE THROUGH CONSTRUCTION OF SEWAGE DISPOSAL SYSTEM).
224 NW 26-27 (Iowa 1929).

Descriptors: *Iowa, *Pollution abatement, *Sewage disposal, *Remedies, Treatment facilities, Water pollution, Riparian rights, Local governments, Cities, Reasonable use, Water pollution treatment, Streams, Sewage treatment, Sewers, Outlets, Industrial wastes, Industrial plants, Judicial decisions, Legal aspects.
Identifiers: *Injunction (Prohibitory).

Plaintiff landowner sought to enjoin an alleged nuisance caused by defendant city's emptying of sewage into a stream. Plaintiff contended that, although a sewer system had been built by the city subsequent to the commencement of the action, the city continued to pollute the stream. Defendant contended that the nuisance complained of had been abated by the construction of the sewer system. Defendant also contended that, although a private company had continued to pollute the stream through a sewer outlet unknown to the city, such pollution had ceased after the city instructed the company to cut off their sewer. The lower court determined that damages were allowable, but an injunction was not necessary as the pollution had been abated. The Supreme Court of Iowa, in affirming the lower court dismissal of the injunction, noted that subsequent to the cessation of the private sewer outlet, the stream became clear and odorless. Where a city has subsequently constructed a modern and sufficient sewer disposal system, an injunction to abate the water pollution is unnecessary. (Smiljanich-Florida)
W71-08692

THE FEDERAL NAVIGATION SERVITUDE: IMPEDIMENT TO THE DEVELOPMENT OF THE WATERFRONT,
Eugene J. Morris.
St John's Law Review, Vol 45, No 2, p 189-199, 1970. 11 p, 37 ref.

Descriptors: *Federal government, *Navigation, *Non-navigable waters, *Land tenure, Real property, Social needs, Navigable rivers, Navigable waters, Federal jurisdiction, Administrative decisions, Human population, Ownership of beds, Permits, Relative rights, Riparian land, Riparian rights, Social impact, Compensation, Condemnation value, Political constraints, Construction, Legal aspects, Judicial decisions, Legislation, Rivers and Harbors Act.
Identifiers: *Navigational servitude.

The navigational servitude doctrine, its impact upon waterfront development, and the need for modifying it to meet new priorities are examined in this article. Navigational servitude is defined as the federal right to compel the removal of navigational obstructions without compensation. This right constitutes a cloud on shorefront real property titles, inhibiting real estate development. In congested urban areas with declining port facilities, the doctrine prevents needed housing and industrial shorefront development. Because of their procedural difficulty and infrequency, congressional declarations of non-navigability are depicted as inadequate. Recent expansions of Corps of Engineer authority over construction permits in navigable waters and the effect of state regulation are considered. Proposals authorizing the Secretary of the Army to issue irrevocable or limited permits for shoreline development are discussed. A recent proposal authorizing the Secretary of the Army to study new procedures to allow waiver or modification of navigational servitude is described. The author concludes that continued judicial affirmation of the navigational servitude doctrine does not remove the need for its reassessment in light of changing priorities. (Earl-Florida)
W71-08693

DEPARTMENT OF DEFENSE OFFSHO MILITARY ACTIVITIES PROGRAM.
Department of Defense, Washington, D.C.

Code of Federal Regulations, Title 32, Ch 1, P 252, 1970. 3 p.

Descriptors: *Military aspects, *Continental Sh *Competing uses, *Beds under water, Subsurf waters, Oceans, Inter-agency cooperation, Pric ties, Resource allocation, Coasts, Adoption practices, Administration, Administrative de sions, Tidal waters, Submerged Lands Act, C tinental slope, Continental margin, Leases, Min industry, Oil industry, Military reservations, Wa policy, Federal government, State jurisdicti Regulation.

Policies and procedures for offshore public l utilization by the Department of Defense (DO are herein promulgated. The provisions he apply to all DOD components and concern mili utilization of the Outer Continental Shelf, incl ing: (1) air space above; (2) surface, subsurf and seabed areas; and (3) when necessary, s controlled submerged offshore lands. The D will make minimum essential use of offshore l and will accommodate non-military interests to maximum extent feasible. The DOD will endea to accommodate determinations of the Departm of the Interior or coastal states that the utiliza of offshore public lands for mineral productio highly desirable. Where non-military interests not be accommodated, the DOD will endeavo reach agreements excluding such areas from ing programs. The Assistant Secretary of Def will: (1) develop and maintain a comprehen program of military offshore area utilization sistent with policies established herein, (2) re military programs in light of such policies, and negotiate agreements and conduct liason assu that offshore leasing remains compatible with D missions. The military departments will fo procedures established herein to assure missio tegrity in light of the policies herein promulga (Earl-Florida)
W71-08694

NATURAL RESOURCES: CONSERVAT AND MANAGEMENT.
Department of Defense, Washington, D.C.

32 Code of Federal Regulations, part 263, 19 p.

Descriptors: *Military reservations, *Na resources, *Conservation, *Water resources, ministration, Resource allocation, Water cons tion, Water policy, Military aspects, Wildlife, use, Integrated control measures, Land resou Recreation, Adoption of practices, Forest ma ment, Public rights, Wildlife conservation, Wi management, Ecology, Environment, Project poses, Federal project policy, Scenery, Resou Preservation.

A Department of Defense (DOD) natural res program, and policies pertaining thereto herein established in compliance with admin tion policies and 10 U.S.C. Section 2671. general policy, the DOD has an obligati restore, develop, and conserve those n resources under military control. Such pro need not and shall not be mutually exclusive military missions. Command personnel will su conservation programs by encouraging p sional participation in natural resource discip Outdoor recreation and natural beauty w recognized as program objectives. DOD ponents will assure cooperation and coordi with federal, state, and local resource age Defense installations shall be managed in pliance with policies herein set forth. resource policies include the establishment c conservation programming, budgeting, and fi ing; (2) soil and water management program forest management plans; (4) fish and w management programs; and (5) pollutio

esticide control policies. Access to installations by ie public and conservation officials shall be ranted under conditions herein specified. Installa- on conservation committees shall be established. he Secretary of Defense's Annual Conservation ward, and the DOD Natural Resources Group are ereby established. (Earl-Florida)
/71-08695

TATE TAX INCENTIVES TO FIGHT POLLU- ION,
hn W. McNulty.
merican Bar Association Journal, Vol 56, p 747-50, 1970. 4 p, 18 ref.

escriptors: *Pollution abatement, *Treatment cilities, *Tax rate, *Legislation, State jurisdic- on, Taxes, State governments, Industrial wastes, ater pollution control, Water pollution treat- ent, Administration, Air pollution, Water pollu- on, Abatement, Environmental sanitation, Coor- nation, Financial feasibility, Interstate, Non- ructural alternatives, Capital costs, Economic stification, Government supports, Investment, gal aspects.
entifiers: *Tax incentives.

ax incentives for industrial pollution control cilities have not been in the limelight of current vironmental conflicts. This article examines the ture and adequacy of state pollution abatement x incentives. The revenue-producing laws of at ast thirty-one states embody such provisions. In ost states, pollution control facility certification quires that the facility be 'primarily' for the con- ol, reduction, or elimination of air or water pollu- on. The author views this requirement as limiting e effectiveness of incentives. Because the Inter- l Revenue Code's definition of pollution control cilities is tied into state law, this requirement also pairs the availability of federal pollution control ite-offs. Incentive categories discussed include:) property tax exemption, (2) sales and use tax emption, (3) income tax credits, and (4) anchise tax exemptions. The failure of several in- strial states to adopt incentives is noted, as is the ncept of focusing incentives on a particular urce of pollution, such as automobiles. The thor concludes that: (1) statutory uniformity ould increase incentive utilization; (2) a full spec- um of incentives is needed; and (3) a re-examina- n of the primary purpose doctrine, aimed at tablishing realistic certification standards, would useful. (Earl-Florida)
71-08696

ONTINENTAL SHELF OIL DISASTERS: HALLENGE TO INTERNATIONAL POLLU- ON CONTROL,
nnis M. O'Connell.
rnell Law Review, Vol 55, p 113-128, 1970. 16 93 ref.

scriptors: *Water pollution, *Oil, *Oil industry, ontinental Shelf, Marine geology, Oceans, ater pollution effects, Water pollution sources, ater pollution control, Pollutants, Pollution atement, Legislation, International law, Interna- nal waters, Legal aspects, Law of the sea, Marine imals, Marine plants, Plankton, Marine fish, gulation, United States, Foreign waters, Foreign untries.
ntifiers: *Oil Pollution Act.

e Santa Barbara Channel oil spill and the Torrey nyon disaster illustrate the need for international ion to prevent oceanic oil pollution. In addition the birds and mammals imperiled by oil spills, h spills may result in a mass destruction of es- tial organisms in the food chain of marine life. o, tiny sea plants produce an overwhelming per- ntage of the world's oxygen, and continuing pol- ion could create serious oxygen depletion. sent legislation--the Oil Pollution Acts of 1924 d 1961 and the Clean Waters Restoration Act of 66--provides insufficient protection from pollu- n, although the provisions of the Water Quality Improvement Act are a great improvement. International regulation of oil pollution was attempted in a twenty-nation convention, but the convention applies only to ships of the signatories in their territorial waters. Current international regulation of the Continental Shelf takes a nationalistic approach to pollution, depending on the licensing nation to protect itself from pollution. The International Maritime Consultative Organization may provide more effective international regulation of pollution at sea. (Hart-Florida)
W71-08697

FOREWORD TO SYMPOSIUM--LAW AND THE ENVIRONMENT,
Edmund S. Muskie.
Cornell Law Review, Vol 55, No 5, p 663-665, 1970. 3 p.

Descriptors: *Pollution abatement, *Environment, *Water pollution, *Air pollution, Cities, Public rights, Water pollution sources, Water pollution effects, Water pollution control, Legal aspects, Environmental effects, Industries, Pollutants, Waste treatment, Water pollution treatment, Local governments, Legislation.

As the great industrial cities of the United States grew, the affluent citizens lived in the northern and northwestern portions of the cities, since the prevailing winds from those directions prevented contact with industrial pollution. However, pollution now affects all segments of the society. Tolerating pollution ultimately is more expensive than permitting it; hence many citizens support immediate expenditure of necessary funds to abate pollution. The Water Quality Act and the Air Quality Act are based upon a conviction that public standards for air and water quality should govern uses of air and water resources. Air pollution emissions must be controlled to satisfy air quality standards of the region; water pollution should be controlled through joint treatment plants between municipalities and industry. Legislation controlling pollution from vehicles and boats, as well as noise pollution, is required. To accomplish pollution abatement, a majority of Americans must adopt new attitudes. Furthermore, extensive planning for environmental protection by both private and public concerns is necessary. The law must provide protection for the environment. (Hart-Florida)
W71-08698

LEGISLATION AND THE ENVIRONMENT: INDIVIDUAL RIGHTS AND GOVERNMENT ACCOUNTABILITY,
Richard L. Ottinger.
Cornell Law Review, Vol 55, No 5, p 666-673, 1970. 8 p, 18 ref.

Descriptors: *Environment, *Pollution abatement, *Federal government, *Legislation, Public rights, Public health, Environmental effects, Administrative agencies, Administrative decisions, New York, New Jersey, Ecology, Marine animals, Marine plants, Water pollution, Water pollution sources, Water pollution effects, Water pollution control, Pollutants, Sewage, Industrial wastes, Hudson River.
Identifiers: *Constitutional amendment.

Man has viewed his environment as a horn of plenty. However, the relationship between man and the environment has reached a critical stage, and public concern with the pollution threat has generated a rash of proposed solutions. Whether the proposals will ultimately abate pollution is questionable, because the real problem is that our institutions are rooted in notions of inexhaustible supply of natural resources. A near-catastrophic example of the failure of our institutions to act is the 'Dead Sea' at the mouth of New York Harbor. The 20 square mile area is totally devoid of marine life because the area lacks sufficient oxygen. This condition is the direct result of sewage and industrial waste being dumped into the sea and the Hudson River. Although federal laws exist to avert ecological catastrophes such as that of New York Harbor, the failure of our agencies to act under the law results from the public's failure to establish a clear social policy for environmental protection. Since statutes may be easily amended, a constitutional amendment is necessary to protect the environment, along with coordination of federal action, judicial review of agency action, and individual concern for the environment. (Hart-Florida)
W71-08699

THE RIGHT TO A DECENT ENVIRONMENT: E—MC2: ENVIRONMENT EQUALS MAN TIMES COURTS REDOUBLING THEIR EFFORTS,
E. F. Roberts.
Cornell Law Review, Vol 55, p 674-706, 1970. 33 p, 90 ref, 1 append.

Descriptors: *Environment, *Legal aspects, *Pollution abatement, *Air pollution, Water pollution, Pollutants, Industries, Water pollution control, Water pollution sources, Water pollution effects, Federal government, State governments, Local governments, Cities, Air pollution effects, Public health, Adjudication procedure, Judicial decisions.
Identifiers: *Constitutional rights.

Seeking a means to enforce man's right to a decent environment, this article first analyzes several nuisance decisions which refused to enjoin industrial pollution by applying the balancing of interests theory. The selection of sites for industrial plants was considered a major factor in the decisions. Next, the author postulates that a nuisance may amount to constitutionally prohibited inverse condemnation. He also suggests that local governments condemn development rights on their peripheries, i.e. require municipal consent for development as a part of regional environmental and economic planning integration. Constitutional amendments establishing a right to an environment fit to sustain healthy human life are suggested. The author believes that a similar constitutional right to a decent environment might be found as a part of substantive due process. However, the impact of such a constitutional holding is seen to require that agencies merely give sufficient weight to environmental considerations in their decisions. It is observed that a constiutional right to a decent environment would not seriously depart from the grundnorm. Included by appendix is one commissioner's objection to establishment of a nuclear plant in Diablo Canyon, a project approved by the California Public Utility Commission. (Hart-Florida)
W71-08700

THE WILD AND SCENIC RIVERS ACT OF 1968,
A. Dan Tarlock, and Roger Tippy.
Cornell Law Review, Vol 55, p 707-739, 1970. 33 p, 135 ref.

Descriptors: *Wild rivers, *River systems, *Scenery, *Recreation, Condemnation, Eminent domain, Scenic easements, Natural resources, Aesthetics, Conservation, Parks, Roads, Legislation, Federal government, State governments, Legal aspects, Judicial decisions, Administrative agencies, Administrative decisions, Water pollution, Water resources, Water resources development, Banks, Water pollution control.

The Wild and Scenic Rivers Act is a counterweight to federal dam-building programs and limits development of certain rivers and their banks in the name of recreation. The Act is a reaction to the profusion of dams and reservoirs and seeks to preserve some rivers in their natural state. Eight rivers were initially protected; in addition, 27 more rivers were designated for potential inclusion after further study. Protection may be extended to three types of rivers defined in the Act. Either scenic easements or fee simple title in lands contiguous to the rivers may be acquired. The river corridors are to be managed to emphasize aesthetic, scenic, historic, and archeological features. The Act does

not provide for judicial review of administrative decisions concerning the corridors; however, courts tend to find such decisions reviewable under the Administrative Procedure Act. Also, water resources programs inconsistent with the Act are restricted. The state reservation doctrine is apparently subservient to the Act under the supremacy clause. Although the Act provides only a vague reference to control of pollution, control of the river corridor should prevent pollution from waste discharge. (Hart-Florida)
W71-08701

AGRICULTURE: THE UNSEEN FOE IN THE WAR ON POLLUTION,
N. William Hines.
Cornell Law Review, Vol 55, p 740-760, 1970. 21 p, 111 ref.

Descriptors: *Agriculture, *Water pollution, *Pesticides, *Fertilizers, Chemicals, Farm wastes, Nitrogen compounds, Phosphorus compounds, Water pollution sources, Water pollution effects, Irrigation practices, Leaching, Confinement pens, Domestic wastes, Soil disposal fields, Waste disposal, Eutrophication, Waste assimilative capacity, Salinity, Saline soils, Salt tolerance, Sedimentation, Sediment Control, Soil conservation.

Agricultural wastes have received practically no attention in recent efforts to prevent and abate water pollution. Control of municipal and industrial wastes may be cancelled by failure to control the four major sources of agricultural pollution: animal wastes, chemicals, sediment, and salt. Pollution from animal wastes results primarily from the use of feed-lots to fatten beef. Feedlot runoff is high in oxygen demand, depleting oxygen supplies in streams; furthermore, the various nutrients in such wastes cause eutrophication. Pollution from feedlots may be controlled by treating drainage and disposing of accumulated solid wastes, although the latter solution has proved difficult. Both agricultural fertilizers and pesticides are major factors in water pollution. Fertilizer, through its chief nutrients--nitrogen and phosphorus--is also responsible for eutrophication. Moreover, use of fertilizer is virtually unregulated. Although pesticide usage is strictly regulated, present regulations are not directed towards water pollution. The potential harm of pesticides has not been thoroughly evaluated. Quantitat ively, sediment is the most serious agricultural water pollutant; inefficiency of soil conservation districts is primarily responsible. Excessive salinity affects agricultural productivity. Irrigation increases the problem, and an adequate solution has been evasive. (Hart-Florida)
W71-08702

LEGAL PLANNING FOR THE TRANSFER OF WATER BETWEEN RIVER BASINS: A PROPOSAL FOR THE ESTABLISHMENT OF THE INTERBASIN TRANSFER COMMISSION,
Michael D. White, and Charles P. Eddy.
Cornell Law Review, Vol 55, p 809-845, 1970. 37 p, 236 ref.

Descriptors: *Inter-basin transfers, *Water resources development, *Water supply, *Water transfer, Water rights, Appropriation, Natural flow doctrine, Preferences (Water rights), Prior appropriation, Riparian rights, Competing uses, Relative rights, Reasonable use, Legislation, Eminent domain, Condemnation, Compensation, Federal government, State governments, Navigation, Interstate commissions, River basin commissions, Interstate rivers, Water policy, Equitable apportionment.

Although water scarcity in particular areas might be alleviated by interbasin transfers, this solution is prevented by the absence of cooperative water resources management. Traditional water law protects stream water rights in the source basin either by the prior appropriation or the riparian rights doctrine. Rights in underground water are also protected by various doctrines. In addition, water rights in the area of origin may be protected by state statutes, federal legislation, or anti-export statutes. Acquisition of vested water rights in the area of origin is a major obstacle to interbasin transfers. Transfer planners must decide: (1) which uses in the transferee basin should be favored at the expense of which uses in the transferor basin, (2) whether water rights may be obtained by purchase or condemnation, and (3) the value of water rights so obtained. Additionally, the federal government may take water rights without exercising the eminent domain power under the proprietary power or the navigation power. States may also take water rights without compensation under the navigation servitude. However, an effective organization for arranging interbasin transfers is lacking; therefore, a new federal agency, the Interbasin Transfer Planning Commission, is required to coordinate transfers with river basin commission. (Hart-Florida)
W71-08703

ENVIRONMENTAL CONTROL: HIGHER STATE STANDARDS AND THE QUESTION OF PREEMPTION,
Samuel C. V. D. Kilbourn.
Cornell Law Review, Vol 55, p 846-860, 1970. 15 p, 70 ref.

Descriptors: *Legal aspects, *Pollution abatement, *Federal governments, *State governments, Judicial decisions, Legislation, Water pollution, Air pollution, Water pollution control, Federal jurisdiction, State jurisdiction.
Identifiers: Constitutionality.

A recently enacted Minnesota statute imposes stricter radiation controls than do Atomic Energy Commission regulations; the statute has been challenged on the basis of the pre-emption doctrine. This conflict may be a prototype of future controversies in the environmental control area. The federal-state conflict arises from the state power to protect the public health and welfare vis-a-vis federal powers under the general welfare clause. Since the Constitution explicitly pre-empts state action in only a few areas, federal pre-emption is generally implied from the breadth of federal regulation and the supremacy clause. However, whether preemption has occurred is a matter for the courts. A determination of implied supersedure of state action chiefly amounts to judicial balancing of competing federal and state interests. However, a presumption in favor of concurrent state power assists the courts in upholding state action. Moreover, state action involving potentially violent labor picketing has been upheld despite the pervasiveness of the Taft-Hartley Act. Analogously, state environmental protection laws may be sustained despite federal nationwide pollution control efforts. (Hart-Florida)
W71-08704

WATER POLLUTION CONTROL IN VERMONT: A SYSTEM OF EFFLUENT CHARGES,
Hobart Birmingham.
Journal of Law Reform, Vol 4, No 1, p 135-147, 1970. 13 p, 73 ref.

Descriptors: *Vermont, *Water pollution control, *Water quality control, *Water permits, Legislation, Effluents, Economic justification, State governments, Pollution abatement, Water pollution, Administration, Administrative decisions, Administrative agencies, Legal aspects, Permits, Water quality, Waste disposal, Wastes, Waste water (Pollution), Judicial decisions, Non-structural alternatives, Environmental sanitation, Water policy, Supervisory control (Power), Adoption of practices.
Identifiers: *Effluent charges.

Examined in this note are the strengths and weaknesses of Vermont's 1970 water pollution control law. Basically, the Act directly regulates water quality standards through the issuance of discharge permits. However, it includes provision for tempo-

rary, non-complying permits coupled with effluent charges based upon damage to downstream use. Permanent permits will be granted only upon finding that the quality of receiving water will not be diminished below established standards. By incorporating and upgrading existing quality standards, the Act could result in virtually pollution free waters. In the author's view the Act's effectiveness will depend upon: (1) administrative flexibility in adjusting discharge levels, (2) judicial interpretations of 'receiving waters', and (3) utilization of discretionary and judicial remedies. Possible adverse consequences of balancing economic and water quality standards are considered. The Act's effluent charge provision is examined with respect to its: (1) use in balancing interests, (2) underlying economic rationale, and (3) utility as a pollution abatement incentive. The author concludes that the Act falls short of model status in that it misconstrues the goal of effluent charges and attempts to combine two distinct water management systems. (Earl-Florida)
W71-08705

SAVING BYRON'S SEA: FEDERAL AND STATE REGULATION OF OIL POLLUTION FROM OCEAN PETROLEUM PRODUCTION,
William John Rathje.
Hastings Law Journal, Vol 22, No 3, p 485-5[illegible] 1971. 38 p, 178 ref.

Descriptors: *Oil wells, *Oily water, *Water pollution sources, *Oceans, Drilling, Offshore platforms, Federal government, State governments, California, Legislation, Submerged Lands Act, Administrative agencies, Inspection, Control, Remedies, Continental Shelf, Natural resources, Water pollution, Water pollution control, Pollutants, Damages, Resource development, Regulation, Public rights, Marine geology.

Discussing the problem of oil pollution from offshore petroleum drilling, the main concern of this article are the existing legal controls designed to minimize the incidence of oil pollution resulting from the development of marine petroleum resources. The author considers the situation that exists in California and identifies both the federal and state law designed to prevent oil spill incidents. He also points out inadequacies in government controls and makes some recommendations for new legislative action. Attention is also given to the rights of private individuals damaged by oil spills. The Department of the Interior and two of its subagencies exercise jurisdiction over ocean petroleum development. Regulationg governing oil drilling inform operators of their responsibility to avoid pollution and set minimum technical standards for operation of wells. The principal deficiencies in the Federal program result from inadequate inspection of offshore drilling operations and the absence of sanctions. California is more rigorous in its control as its provisions concerning responsibilities and technical standards are buttressed by sanctions and systematic inspections. The author also considers the geological problems involved in offshore drilling and the need for increased government regulation in this area to improve the safeguards against pollution. (Duss-Florida)
W71-08706

THE LAW OF WATER DISTRIBUTION IN IOWA AND SOUTH DAKOTA: A COMPARISON OF THE RIPARIAN AND APPROPRIATIVE SYSTEMS,
Max A. Gors.
Drake Law Review, Vol 20, No 2, p 256-287, [illegible] 32 p, 418 ref.

Descriptors: *Iowa, *South Dakota, *Water allocation (Policy), *Appraisals, Water policy, Water permits, Legislation, Judicial decisions, Appropriation, Water utilization, Legal aspects, Regulation, Reasonable use, Artificial use, Competing uses, Natural flow doctrine, Prior appropriation, Relative rights, Riparian rights, Water rights, Comparative benefits, Preferences (Water rights), Prior rights, Riparian waters, Riparian land, Administration

legal theories underlying surface and ground-
er distribution in Iowa and South Dakota are
yzed and contrasted in this article. The
elopment of water law is determined by climate,
graphy, topography, and use. The history,
elopment, principles, and nature of prior ap-
priation and riparian doctrine in semi-arid
th Dakota, and of riparianism in more humid
, are examined. Riparian principles relating to:
land ownership; (2) natural watercourses; and
the doctrines of natural flow, reasonable use,
icial use, and non-riparian use are analyzed by
author. The nature and history of appropriative
rests in South Dakota are examined. A com-
son of diffused surface water theory in both
s is made. Differing rules control underground
ams and percolating groundwater. The com-
law and prior appropriation rules governing
olating groundwater are analyzed. The sources
uthority for water distribution administration in
states are contrasted in terms of: (1) policy,
non-regulated uses, (3) regulations, and (4)
stitutional questions. The procedures, duration,
ileges and rights, and nature of the interest
ted by each state's water permit system are
yzed. (Earl-Florida)
-08707

REATIONAL DEVELOPMENT AT
ENSED PROJECTS.
eral Power Commission, Washington, D.C.

eral Register, Vol 35, No 76, p 6315, Apr 1970.

criptors: *Federal Power Act, *Safety,
creation facilities, *Federal project policy, Ad-
istrative agencies, Recreation, Safety factors,
ption of practices, Administration, Decision
ing, Legal aspects, Legislation, Federal govern-
t, Project planning, Regulation, Administrative
sions.
tifiers: Administrative regulations.

eral Power Commission policy concerning
ty measures at outdoor recreational projects
nsed under the Federal Power Act is herein
ified and amended. Federal Power Commission
er No. 375 was intended to provide examples of
ty measures for the guidance of licensees,
reationists, and the public. It was not intended
equire the installation of specific safety facili-
, nor to establish legal standards. To make it
r that no legal requirement was intended, and
suant to the Federal Power Act, paragraph (f)
of Section 2.7 of the Commission's general pol-
and interpretations is therefore deleted. (Earl-
ida)
-08708

POLLUTION REGULATIONS.
st Guard, Washington, D.C.

Code of Federal Regulations, part 151, 1970. 4

criptors: *Oil wastes, *Water pollution control,
ips, *Coast Guard regulations, Adoption of
ctices, Water pollution sources, Boats, Oily
er, Storage tanks, Water quality control, Super-
ry control (Power), Pollutants, Pollution abate-
t, Regulation, Administration, Administrative
isions, Sea water, Legal aspects, Legislation,
ties.
ntifiers: Oil Pollution Act of 1961.

e administrative regulations set forth herein im-
ment the Oil Pollution Act of 1961, which in
n implements the International Convention for
Prevention of Pollution of the Seas by Oil. Sub-
t to certain exceptions, the regulations are ap-
cable to any seagoing vessel of American registry
nationality. Foreign vessels to which the Con-
tion applies may be boarded and examined in
S. territorial waters. Employees of the Corps of
gineers, the Bureau of Customs, and the Coast
ard are designated to board vessels, make in-
ctions, require the production of records, and arrest violators. All sea areas within 50 miles of land, and the eleven zones herein described, are prohibited zones. An oil record book shall be maintained and descriptive entries made after the following operations: (1) ballasting or discharge of tanker ballast, (2) cargo tank cleaning, (3) slop tank settling or water discharge, (4) disposal of oily residues, (5) ballasting or cleaning bunker-fuel tanks, and (6) exceptional or accidental oil discharges. Upon the completion of foreign voyages, such book shall be delivered to the Coast Guard. The record book shall remain on board during and after non-foreign voyages. Penalties for violations of these regulations are contained in the Oil Pollution Act of 1961. (Earl-Florida)
W71-08709

MAINTENANCE OF WATER LEVELS AT TWO RESERVOIR PROJECTS.

33 Code of Federal Regulations, Title 33, Ch 2, secs 208.65, 208.66, 1970. 4 p.

Descriptors: *Alabama, *Reservoir operation, *Flood control, *Water levels, Reservoirs, Dams, Reservoir storage, Water storage, Discharge (Water), Hydroelectric plants, Hydroelectric power, Regulation, Administrative agencies, Administration, Outlets, Rivers, Projects, Federal government.

In the interest of flood control, the Alabama Power Company, as owner and operator of two dam and reservoir projects, shall operate them in accordance with regulations promulgated herein by the United States Army Corps of Engineers. The water levels at both projects are to be maintained according to their respective Storage Delineation Curves (top-of-power-pool curves). Specific provisions prescribe the circumstances, ways, and quantities in which water may be released and discharged. Releases made in accordance with these regulations are subject to the condition that they shall not be made in a manner inconsistent with protecting the dams and reservoirs from major damage. The power company shall furnish to the District Engineer such hydrological data as may be necessary to monitor the flood control operations of the projects. These regulations are subject to modification by the District Engineer if conditions make such modification desirable. (Duss-Florida)
W71-08710

POLLUTION OF THE GREAT LAKES AND SOLID WASTE DISPOSAL AT SEA.
116 Cong Rec H 3068 (daily ed), 4 US Code Cong and Admin News p 1095-1096 (1970). 2 p.

Descriptors: *Great Lakes, *Dredging, Waste dumps, *Oceans, Water quality control, Water pollution control, Federal government, Pollution abatement, Legislation, Legal aspects, Spoil banks, Water pollution sources, Environmental effects, Disposal, Environmental engineering, Pollutants, Municipal wastes, Garbage dumps, Investigations, Administration, Adoption of practices, Leadership, State governments.
Identifiers: Presidential messages.

This Presidential message to Congress deals with: (1) administration proposals to restrict polluted dredge-spoil dumping in the Great Lakes; and (2) the initiation of a study examining solid waste disposal in the oceans. The administration's bill, aimed at restoring the Great Lakes, would: (1) discontinue polluted dredge-spoil disposal by the Corps of Engineers and private interests, (2) require that such disposals be made in containment areas, (3) require states and other non-federal sources to provide one-half the cost of such containment areas, and (4) suspend Corps of Engineer dredging after one year if local interests fail to make reasonable progress in establishing containment areas. Periodic program progress reports would be made by the Secretary of the Army. The Council on Environmental Quality has been directed, in conjunction with other federal, state and local agencies, to undertake a comprehensive study of ocean dumping. This study will examine the following areas: (1) the effects of ocean dumping on the environment, (2) the adequacy of existing legislation, (3) amounts and areas of toxic dumping, (4) the availability of land disposal sites, (5) alternative disposal methods, (6) suggested innovative ideas, and (7) institutional problems. (Earl-Florida)
W71-08711

LIABILITY FOR OIL POLLUTION CLEANUP--NON-SELF-PROPELLED BARGES EXEMPTED UNDER CERTAIN CIRCUMSTANCES.

Federal Register, Vol 36, No 43, p 4293-4294, Mar 1971. 2 p.

Descriptors: *Oil, *Water pollution sources, *Regulation, *Administrative agencies, Water pollution, Navigable waters, Federal government, Legislation, Navigation, Transportation, Harbors, Bodies of water, Fuels, Administrative decisions, Water pollution control.

Setting forth the Federal Maritime Commission's regulation covering financial responsibility for oil pollution cleanup, this report by the Commission discusses the exemption from liability under the financial responsibility section. Section 11 (p) (1) of the Federal Water Pollution Control Act as amended requires every vessel exceeding a certain size to maintain evidence of financial responsibility in case of discharge of oil into waters of the United States. However, the Rivers and Harbors Act of 1970 (Public Law 91-611) excludes from financial responsibility non-self-propelled barges carrying no oil as cargo or fuel. In order to conform to this new law the Commission amended its regulations, including new sections defining 'cargo' and 'fuel'. Several shipping organizations and companies submitted comments to the Commission in favor of a less restrictive definition of fuel than the one proposed by the Commission so as to permit the carrying of small quantities of oil aboard non-self-propelled barges used to operate machinery on these barges. The Commission rejected the contentions of these parties. For purposes of their regulations 'fuel' means any oil used or capable of being used to generate heat or power by burning. (Duss-Florida)
W71-08712

ENVIRONMENTAL INFORMATION.
Environmental Science Services Administration, Washington, D.C.

15 Code of Federal Regulations, part 907, 1970. 1 p.

Descriptors: *Weather data, *Weather forecasting, *Publications, *Meteorological data, Weather, Technical writing, Climatic data, Storms, Snow, Rain, Data collections, Forecasting, Charts, Maps, Libraries, Information retrieval, Documentation, Statistics, Environment, Flow profiles, Ocean currents, Tides, Seismic waves, Seismology, Weather patterns.
Identifiers: *Environ Science Serv Admin.

The types and availability of information disseminated by the Environmental Science Services Administration (ESSA) are herein described. ESSA gathers, processes, and issues information on : (1) weather conditions, (2) river water height, (3) coastal tides and currents, (4) ocean current movement, (5) ocean basin shapes and structures, (6) seismic activity, (7) precise earth shape and size, and (8) space and upper atmospheric conditions. Hurricane, tornado, flood, and seismic sea-wave warnings are also issued. ESSA information falls into three categories: (1) current information and warnings on dynamic environmental conditions; (2) charts, historical summaries, graphic recordings, and other longer term information; and (3) technical earth science research. Current information is disseminated either directly, through

local offices, or through relaying mediums. A Daily Weather Map and a Weekly Weather and Crop Bulletin may be ordered through the Superintendent of Documents, Washington, D.C. Longer term information may be purchased through local sales agents or through ESSA. Price lists and catalogs are available. Information concerning scientific and technical research publications may be obtained. (Earl-Florida)
W71-08713

COUNTY DITCH NO. 13, JACKSON COUNTY V BOARD OF COUNTY COMMISSIONERS (BOARD'S DENIAL OF PETITION TO IMPROVE DITCH FOUND REASONABLE).

182 NW2d 715-717 (Minn 1971).

Descriptors: *Minnesota, *Drainage, *Ditches, *Controlled drainage, Land, Land tenure, Construction, Culverts, Surface waters, Rainfall, Damages, Surface drainage, Surface runoff, Legislation, Judicial decisions, Legal aspects.

Plaintiff landowners petitioned to have a drainage ditch benefiting their land improved because it was of insufficient capacity to handle additional drainage. The county board of commissioners dismissed the petition, stating that the proposed improvement was not practicable and would not benefit the public. One petitioner appealed to the district court, which affirmed the county board's ruling. The Supreme Court of Minnesota affirmed the district court. In matters involving construction and improvement of drainage facilities a substantial amount of discretion lies with the governmental body first having jurisdiction over the matter. Their decisions will not be overturned unless there is no legal basis for them. The evidence here supported the district court's determination that the county board's denial of the petition was not arbitrary, unlawful, nor unsupported by the evidence. (Duss-Florida)
W71-08714

HOLBROOK V APPLEBERRY (RIGHTS AND RESPONSIBILITIES OF ADJACENT LANDOWNERS IN COMMON DRAINAGE DITCH)
463 SW2d 100-102 (Ark 1971).

Descriptors: *Arkansas, *Ditches, *Easements, *Drainage, Judicial decisions, Legal aspects, Boundaries (Property), Farms, Overflow, Drainage water, Surface runoff, Land tenure, Land, Relative rights.

A determination of the respective rights and responsibilities of appellee and appellant landowners in a common drainage ditch was sought. The ditch ran down their common boundary, across appellant's tract, and into a bayou. The ditch was constructed under an oral agreement between appellee and appellant's now deceased husband; both contributed to the construction costs. The chancellor held that: (1) the ditch was mutual and common, (2) each party possessed a drainage easement across the lands of the other, (3) neither party could obstruct the drain without consent of the other, (4) the parties could have the ditch restored to its former depth and width, and (5) each party should maintain the ditch on his own land. Appellant contended that these findings were unsupported by the evidence and that appellee had purchased additional land draining into the ditch. The Arkansas Supreme Court upheld the chancellor's finding and rejected appellant's assertion that appellee was surcharging the easement. The court found that the evidence failed to demonstrate which party had caused the ditch to become overburdened with water. (Hart-Florida)
W71-08715

CITY OF GLADSTONE V HAMILTON (DAMAGES FOR CONDEMNATION WHERE NO SPECIAL BENEFIT INURES TO THE LANDOWNER)
463 SW2d 622-626 (Ct App Ky 1971).

Descriptors: *Missouri, *Condemnation, *Adjudication procedure, *Sewers, Eminent domain, Damages, Compensation, Cities, Easements, Right-of-way, Legal aspects, Judicial decisions, Urbanization.

Plaintiff municipality brought action against defendant landowner to condemn a sewer easement. Plaintiff asserted that defendant was not damaged by the taking. After instructing the jury on damages, the trial court gave the following instruction on plaintiff's motion: 'your verdict must be for plaintiff . . . if you do not believe that the defendants have been damaged.' The jury found no damages. However, the Kansas City Court of Appeals stated that any taking implied at least nominal damages, and a verdict of no damages was authorized only when plaintiff had shown special benefits inuring to defendant which exceeded his damages. Since plaintiff had not provided evidence of special benefits, the court held that the jury instruction for plaintiff was prejudicial error and was not consistent with the rules of procedure. The action was remanded for a new trial. (Hart-Florida)
W71-08716

CHIPLEY V BEELER (LIABILITY FOR ALTERING FLOW OF SURFACE WATER).
178 SE2d 767-769 (Ct App Ga 1970).

Descriptors: *Georgia, *Surface runoff, *Ridnce (Legal aspects), *Repulsion (Legal aspects), Drainage water, Surface waters, Surface drainage, Culverts, Drainage effects, Drainage practices, Drainage, Damages, Local governments, Relative rights, Paving, Construction, Alteration of flow, Water pollution, Ponds, Easements, Real property, Land tenure, Legal aspects, Judicial decisions, Adjudication procedure.

Plaintiff upper landowner sought to enjoin defendant down-hill property owners from obstructing the natural flow of surface water. The construction of plaintiff's driveway by the county had caused polluted surface water to accumulate on defendants' property. A subsequent extension of plaintiff's drainage pipe caused such water to flow into defendants' pond. Defendants sealed this pipe causing water to back up on plaintiff's property. Plaintiff claimed an interference with his drainage easement. Defendants, counterclaiming, sought an injunction and both punitive and special damages for plaintiff's diversion of polluted waters. The trial court entered injunctions against both parties. The plaintiff appealed a jury verdict on defendants' counterclaim. The Georgia court of appeals held that one who accepts a county's construction of a driveway altering the natural flow of surface water is liable for special and punitive damages arising from such alteration of flow. Plaintiff by accepting the driveway ratified the tortious act committed. The fact that defendants' pond had been made useless for swimming and fishing supported the verdict. (Earl-Florida)
W71-08717

TEXAS GAS TRANSMISSION CORP V KINSLOW (VALUATION OF SPRING IMPAIRMENT).
461 SW2d 69-72 (Ky 1970).

Descriptors: *Kentucky, *Damages, *Pipelines, *Springs, Cold springs, Groundwater, Percolating water, Spring waters, Confined water, Seepage, Fresh water, Real property, Land tenure, Right of way, Subsurface waters, Subsurface flow, Permeability, Contracts, Claims (Contracts), Legal aspects, Judicial decisions, Adjudication procedure, Groundwater movement.

Plaintiff farm owners sought damages from defendant pipeline owner for impairment of a spring. Defendant's installation of a gas pipeline has permanently dried up a spring on one of plaintiffs' two adjoining tracts of land. Plaintiffs contended that they granted the pipeline right-of-way in return for an oral agreement to compensate them for any spring impairment. Defendant appealed as excessive, a judgment in favor of the plaintiffs. The K tucky Court of Appeals held a determinatio damages to a multi-tract farm, from the impairm of a spring, must be based upon: (1) a before after market valuation of all tracts as a si economic unit; (2) the diminution in market va absent evidence the impairment can be cured; (3) testimony restricted to the highest and potential uses of the farm. Plaintiffs' pa evidence regarding defendant's compensa agreement was held admissible as consideratio plaintiffs' agreement. Determining plain damages had not been properly valued, the c reversed the judgment. (Earl-Florida)
W71-08718

HICKS V SEABOARD COASTLINE RR FECT OF RIVER'S NAVIGABILITY U RAILROAD'S LIABILITY FOR INJUR FISHERMAN).
179 SE2d 532-535 (Ct App Ga 1970).

Descriptors: *Georgia, *Railroads, *Navig rivers, *Lumber, Pulp and paper industry, Bri Non-navigable waters, Rivers, Fishing, Jud decisions, Legal aspects, Adjudication proce Remedies.

Plaintiff fisherman sued defendant railroad damages. While fishing under a trestle belongi defendant, plaintiff was injured by a log fa from one of defendant's trains. Defendant tended that the river in which plaintiff was fi was navigable and therefore not railroad prop Prior judicial decisions required railroads to precautions to prevent injury to persons in vicinity of a railroad right-of-way where presence was known or could be reasonabl ticipated. Hence the Georgia Court of Appeals that the navigability of the river was immateria determination of defendant's negligence and li ty and that the trial court had not erred by ref to admit evidence of navigability. (Hart-Florid
W71-08719

STEPPED-UP WAR ON POLLUTION.
US News and World Report, p 20-21, Jan 11, 2 p.

Descriptors: *Water pollution, *Air poll *Federal government, *Industries, State go ments, Water pollution control, Pollution a ment, Administrative agencies, Administ decisions, Administration, Regulation, Legisl Judicial decisions, Legal aspects, Effluents, I trial wastes, Discharge (Water), Waste water lution), Taxes, Clean Air Act, Environment vironmental effects.
Identifiers: *National Air Quality Standards *Refuse Act, *Environmental Protection Age

Concern over America's environment is cha from talk to action. The federal governm promulgating more stringent standards to pr air and water pollution. The Environmental P tion Agency is requiring 40,000 industrial pla furnish information concerning effluent disc into waters. In addition, the Treasury Depar has announced tax incentive deprec schedules for pollution control equipment fines are being levied for violation of pollutio trol standards. The National Air Quality Stan Act and the Environmental Protection Agen being used to clean up the air. States, too, enacted environmental protection laws; Il Pennsylvania, Michigan, Florida, and Cali are examples. Additionally, industry is incr actiont to prevent pollution. However, many tries are concerned that the new laws will enforced even-handedly and are being cons changed and tightened; hence, spending for tion abatement by industry is being de Meanwhile, in the courts, lawsuits are being and injunctions sought. A chart in this arti dicates that federal pollution control expend have increased from $768 million in 1969, estimated $1,386 million in 1971. (Hart-Flori
W71-08720

NE OIL POLLUTION AND THE WATER ITY IMPROVEMENT ACT OF 1970,
ork Univ., N.Y. School of Law.
las J. Healey, and Gordon W. Paulson.
l of Maritime Law and Commerce, Vol 1, July 1970), p 537-572.

ptors: *Oil wastes, *Pollution abatement, r quality, *Legislation, Legal aspects, Water

iers: Liability, Water Quality Improvement 1970.

l pollution provisions of the Water Quality vement Act of 1970 and the antecedents of , including: the Oil Pollution Act of 1924 as ed in 1966; the International convention for evention of Pollution of the Sea by Oil; the Oil Pollution Act; and the Federal Water Pol- Control Act are discussed. The principle fea- of the Act which relate to oil pollution are ered such as the civil liability of third parties s or omissions; reimbursement of expenses ners or operators of pollution causing vessels ean up discharges; administration; financial sibility requirements for vessels using United ports; and the presidential regulations to l hazardous substances and vessel sewage. t is compared to the convention on Civil Lia- or Oil Pollution Damage. The most funda- difference between the two is that the con- n provides not only for government claims an up, but also for claims for other damages ed by both public and private interests. Also s a difference in the maximum liability which imposed under each. The provisions of each mpared relating to financial responsibility. n-PAI)
8751

IGUOUS ZONES FOR POLLUTION CON- : AN APPRAISAL UNDER INTERNA- L LAW,
Univ., Fla.
n A. Wulf.
rant Technical Bulletin, No 13, Mar 1971. NSF Sea Grant - GH 100.

ptors: *Oceans, *Oil wastes, *Water pollu- ontrol, *International law, *Water law, lation, *United States, Legal aspects, nments.
iers: *Pollution prevention contiguous Canada.

praisal is made of the lawfulness of con- s zones for pollution control as has been shed by the U.S. and Canada. The interac- tween transportation interests and coastal ts, particularly relating to the oil industry il pollution, is examined. The legislative ound and the competence claimed by the aim to a 12 mile contiguous zone for pollu- ntrol, and by the Canadian claim to a 100 ntiguous zone for pollution control in Arctic , are analyzed. Decision-makers who could with conflicting interests are various inter- mental organizations such as the IMCO, in- onal conferences and courts or tribunals, ficials of nation-state, state-state, and state- ual. Goals for specific competence in con- s zones are clarified, then the specific com- es, claims and trends in decision are evalu- Steps to reduce the oil pollution threat to l interests seem justified, but no state should wed to unilaterally exercise competence in where international interests are paramount. ntyre-PAI)
8754

ENTION ON OIL POLLUTION DED,
International Marine Ltd., London (En-

imary bibliographic entry see Field 05G.
8756

CRITICAL VIEW OF 1969 AMENDMENTS,
Nordic Union on Oil Pollution, Stockholm (Sweden).
For primary bibliographic entry see Field 05G.
W71-08757

THE COASTAL RESOURCES MANAGEMENT PROGRAM OF TEXAS: A SUMMARY.

Coastal Resources Management Program, Interagency Natural Resources Council, A Report to the 62nd Texas Legislature, Dec 1970. 15 p.

Descriptors: *Texas, *Inter-agency cooperation, *Coasts, *Water resources development, *Water management, Legislation, Federal government, State government.
Identifiers: *Interagency National Resources Council, *Texas Coastal Resources Management Program.

This interim report on the Coastal Resources Management Program of Texas is presented by the Interagency National Resources Council, a consortium of State agencies. Fifteen major problems involving the national resources of the Coastal Zone of Texas are examined. The Coastal Resources Management Program has approached the Coastal Zone environment as a balanced system composed of 21 major components needing both individual and interrelated studies. Governmental roles in environmental management must be well defined to provide a clear understanding of Federal, State and local responsibilities and authority. Over 500 environmental bills pending congressional action in Washington would affect the natural resources of the Texas Coastal zone. The Senate and House bills, 'National Estuarine and Coastal Zone Management Act of 1970,' and a Senate bill, the 'National Land Use Policy Act,' are described. The conclusions of this report illucidate the important need for a role of the Texas Coastal Resources Management Program. Specific actions are recommended to the Texas 62 Legislature, including cooperation with the Interagency Natural Resources Council to accomplish nine itemized tasks pertaining to the natural resources of the Coastal Zone. A two-year work plan would include eleven areas of needed investigations. (McEntyre-PAI)
W71-08759

DONALDSON V CITY OF MARSHALL (LIABILITY OF CITY FOR IMPROPER MAINTENANCE OF TILE DRAIN).

247 Mich 357, 225 NW 529-530 (1929).

Descriptors: *Michigan, *Tile drains, *Floods, *Obstruction to flow, Repulsion (Legal aspects), Surface drainage, Drainage, Drains, Surface runoff, Submergence, Sewers, Natural flow doctrine, Alteration of flow, Relative rights, Drainage effects, Drainage systems, Natural flow, Drainage water, Local governments, Cities, Judicial decisions, Legal aspects.

Plaintiff landowner sued defendant city to recover damages for the accumulation of water on plaintiff's land. The damage was allegedly caused by the faulty construction of a tile drain and failure to keep the drain free from obstruction to the natural flow of water. Plaintiff contended that the city failed to use reasonable care in the construction and maintenance of the drain. Defendant contended that it was under no obligation to drain plaintiff's land and denied negligence in the construction and maintenance of the drain. The Supreme Court of Michigan, in affirming a lower court judgment for plaintiff, noted that the city had the authority to establish a system of drainage. When a city establishes a drain, however, it becomes its duty to maintain the drain in such a way as to carry off the natural flow of the water. The city was therefore liable for any damages caused by water accumulating as a result of its failure to properly clean the drain. (Smiljanich-Florida)
W71-08764

MARINE POLLUTION AND FISHERIES,
For primary bibliographic entry see Field 05G.
W71-08765

AFTERMATH OF CALIFORNIA SPILL LINGERS,
For primary bibliographic entry see Field 05G.
W71-08767

HUGHES V VILLAGE OF NASHWAUK (LIABILITY OF CITY FOR NUISANCE CAUSED BY OVERFLOW OF SEWER).
225 NW 898-901 (Minn 1929).

Descriptors: *Minnesota, *Sewers, *Overflow, *Remedies, Sewage disposal, Waste water (Pollution), Surface drainage, Surface runoff, Drainage water, Sewage, Water pollution, Municipal wastes, Land tenure, Relative rights, Damages, Local governments, Cities, Judicial decisions, Legal aspects, Adjudication procedure.
Identifiers: *Nuisance.

Plaintiff landowner sued defendant city to enjoin a nuisance and to recover for damages caused by the nuisance. Plaintiff contended that defendant had abandoned a surface drainage system and caused the surface waters to be discharged into the city sewer system. Plaintiff also contended that the sewer system was inadequate for this purpose and had overflowed, discharging sewage into plaintiff's basement. Defendant contended that plaintiff had failed, as required by law, to give the city notice prior to bringing action. In affirming a trial court order that plaintiff had stated a cause of action, the Supreme Court of Minnesota noted that an owner or lawful occupant of property is entitled to maintain an action for an invasion of his property rights caused by a municipality casting sewage on the property and thereby creating nuisance. Plaintiff had based his claim upon nuisance--not upon negligence. An equitable action for injuction of a nuisance and damages does not require prior notice to the city. (Smiljanich-Florida)
W71-08769

NATIONAL POLICY FOR COASTAL MANAGEMENT,
Washington Univ., Seattle.
Edward Wenk.
Vital Speeches, Vol. 37, No. 6, p 177-181, January 1, 1971.

Descriptors: *Coasts, *Federal government, *Civil engineering, *Water policy, Water management, State governments.
Identifiers: NOAA.

Issues concerning the coastal zone, and policies urgently needed for its management, are examined. The primary issue is how to provide for the many diverse, conflicting coastal demands and still provide the greatest long-term social and economic benefits. Basic needs include a national policy to balance protection and development, comprehensive management plan prepared at the state level for all coastal land and water use, a state regulatory authority, public notices and hearings for management plan development and modification, ecological and policy research, and multi-jurisdictional cooperation. The formulation, operation and potential of the new U.S. National Oceanic and Atmospheric Administration (NOAA) are described. Three major issues the nation faces are 1) establishment of federal policy on coastal affairs, and funds for implementation; 2) development of state management programs; and 3) coastal research and technology development free of politics. The civil engineer should apply himself to the preservation of the coastal zone by public expression and vision, by participating in institutional frameworks for action, by seeking knowledge for better decisions, and by breaking down narrow technical specialization to better unite scientists and the public. (McEntyre-PAI)

W71-08770

TOWN OF LUMBER CITY V PHILLIPS (DUTY OF CITY TO CLEAN UP OPEN SEWAGE DITCH).

164 SE 681 (Ga 1932).

Descriptors: *Georgia, *Cities, *Sewage, *Ditches, Mosquitoes, Public health, Real property, Legal aspects, Judicial decisions, Adjudication procedure.

Plaintiff landowners sought to enjoin defendant city from maintaining an open sewage ditch. Plaintiff alleged that the ditch was a nuisance as malodorous and a breeding place for mosquitoes. Defendant contended that since the ditch was present when plaintiff purchased his land, plaintiff took title subject to defendant's right to maintain the ditch. Defendant also asserted that plaintiff was required to keep the ditch open and repaired. However, the Supreme Court of Georgia held that defendant must abate the nuisance. The verdict of the trial court for the plaintiff was in accordance with the evidence. (Hart-Florida)
W71-08771

BOARD OF SUP'RS V CITY OF RICHMOND (RIGHT OF CITY TO CHARGE FOR SEWER SERVICES).
173 SE 356-361 (Va 1934).

Descriptors: *Virginia, *Natural flow, *Diversion, *Sewers, Conduits, Public health, Drainage, Rivers, Drainage systems, Cities, Sewage disposal, Administrative agencies, Contracts, Costs, Channels, Legal aspects, Judicial decisions.

Plaintiff city brought suit against defendant county board of supervisors to recover sewer charges relating to connection of the county with the city's sewer system. Plaintiff contended it was empowered to make the charges by authority of city ordinances and that the connection constituted a diversion of the natural flow of drainage from the county. Defendant contended that the connection followed the natural flow of drainage and that there had been a judicial determination that the county could not be charged for sewer connections under such circumstances. Defendant also contended that the ordinances relied upon by plaintiff were unlawful. The trial court found for plaintiff and the Supreme Court of Appeals of Virginia affirmed. The evidence supported a finding that the sewer connection was a diversion of the natural flow of drainage. The ordinances relied upon by plaintiff amounted to an offer by it to provide sewer services. Defendant knew of the ordinances, and acceptance of the services bound defendant for payment on a theory of implied contract. (Duss-Florida)
W71-08773

ORSANCO: PIONEER WITH A NEW MISSION,
For primary bibliographic entry see Field 05G.
W71-08825

6F. Nonstructural Alternatives

THE EAST-WEST WATER CONTROVERSY: BOTH SIDES ARE PARTLY RIGHT,
Stanford Univ., Calif.
For primary bibliographic entry see Field 06B.
W71-08820

6G. Ecologic Impact of Water Development

CALIFORNIA'S TIDELAND TRUST: SHORING IT UP,
For primary bibliographic entry see Field 06E.
W71-08430

AN ACT ESTABLISHING THE FLORIDA ENVIRONMENTAL INVENTORY COUNCIL.
For primary bibliographic entry see Field 06E.
W71-08440

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION: FIRST ANNUAL REPORT OF THE MALONEY CANYON PROJECT,
California Univ., Riverside. Dept. of Agronomy.
J. R. Goodin, and W. D. Kesher.
University of California at Riverside, W-236, July 1970. 40 p, 7 tab, 8 fig, 31 ref. OWRR Project B-090-CAL (1).

Descriptors: *Water reuse, *Ecology, *Environmental effects, *Physiological ecology, *Vegetation establishment, California, Population, Water supply, Waste disposal, Chaparral, Instrumentation, Plant groupings, Animal groupings, Land clearing, Irrigation programs, Deer, Bird types, Rodents, Experimental farms, Sewage, Sprinkler irrigation, Automatic control, Implied benefits.
Identifiers: *Fire hazards, *Water-related problems, Rabbit, Coyote, Wood rat, *Greenbelts, Maloney Canyon (San Bernadino National Forest).

Water-related problems of the increasing southern California population include fire hazard, water supply, and waste disposal. A chaparral-covered ridge in Maloney Canyon, San Bernardino National Forest, was instrumented to study species composition before and after clearing, irrigation and introduction of new species. There are 70 vegetation species in the study area. Deer, rabbit, coyote, wood rat, birds and small rodents were inventoried. Forty-eight experimental plots were developed, 100 feet by 200 feet, for irrigation and introduction of 24 new plant species. Thirty-six plots will be irrigated with sewage, under automatic sprinkler control. The project is sponsored by 6 cooperators. Tables list species and water analyses. Figures show location, plot views, work crews, and treatment plant. (Popkin-Arizona)
W71-08491

ENVIRONMENTAL PROTECTION--TVA EXPERIENCE,
Tennessee Valley Authority, Chattanooga.
F. E. Gartrell, and J. C. Barber.
Proceedings, American Society of Civil Engineers, Journal of the Sanitary Engineering Division, Vol 96, No SA6, p 1321-1334, Dec 1970. 14 p, 9 fig, 7 ref, append.

Descriptors: *Agriculture, Environmental engineering, *Environmental effects, *Fertilizers, Fly ash, Natural resources, Nuclear powerplants, Nutrients, Wastes, *Sanitary engineering, Waste heat, Water pollution, Air pollution, *Pollution abatement, Solid wastes, *Ecology, Research and development, Thermal powerplants, Air pollution control.
Identifiers: Nuclear debris, Tennessee Valley Authority, Sulfur dioxide.

The Tennessee Valley Authority has been engaged in environmental protection since the agency was created in 1933, as a result of TVA's responsibility for development and protection of the resources in the Tennessee Valley and for improvement in agricultural practices and education. Several environmental protection projects that function as parts of the program for agricultural development and powerplant operation include: (1) studies of nuisance weed growth in reservoirs, (2) measurement of nutrient discharge from agricultural lands, (3) development of fly ash control methods, (4) research on sulfur dioxide removal from powerplant stack gases, and (5) investigation of environmental effects of waste heat from nuclear powerplants. Environmental protection is demonstrated at fertilizer production units operated by TVA. Also, other fertilizer producers are assisted with environmental problems because some TVA fertilizers possess properties useful in control of wastes in air. In cooperation with another Government agency, treatment and utilization of municipal waste as a soil amendment are being investigat
(USBR)
W71-08640

ECOLOGICAL EFFECTS OF POWER-PLA COOLING,
Oak Ridge National Lab., Tenn. Ecologi Sciences Div.
For primary bibliographic entry see Field 05C.
W71-08762

POSSIBLE EFFECTS OF A SEA-LEVEL CAN ON THE MARINE ECOLOGY OF THE AMI ICAN ISTHMIAN REGION,
Battele Memorial Inst., Columbus, Ohio. Colum Labs.
For primary bibliographic entry see Field 05C.
W71-08763

MONITORING ECOLOGICAL CHANGES THE MARINE ENVIRONMENT,
Clapp (William F.) Labs., Inc., Duxbury, Mass.
For primary bibliographic entry see Field 05A.
W71-08766

NATIONAL POLICY FOR COASTAL MANA MENT,
Washington Univ., Seattle.
For primary bibliographic entry see Field 06E.
W71-08770

BIOLOGICAL AND OCEANOGRAPHI SURVEY OF THE SANTA BARBARA CH NEL OIL SPILL 1969-1970, VOLUME BIOLOGY AND BACTERIOLOGY; VOL PHYSICAL, CHEMICAL AND GEOLOGI STUDIES.
University of Southern California, Los Ang Allan Hancock Foundation.
For primary bibliographic entry see Field 05C.
W71-08776

ECO-ENGINEERING - THE CHALLENGE RESOURCE DEVELOPMENT,
California Dept. of Fish and Game, Stockton.
For primary bibliographic entry see Field 06B.
W71-08802

07. RESOURCES DATA

7A. Network Design

THE NATIONAL HYDROLOGIC BE MARK NETWORK,
Geological Survey, Washington, D.C.
Ernest D. Cobb, and J. E. Biesecker.
Free on application to the US Geological Su Washington, DC, 20242. Geological Survey C lar 460-D, 1971. 38 p, 2 fig, 7 ref.

Descriptors: *Bench marks, *Netw *Hydrologic data, *Data collections, *U States, Hydrology, Hydrologic cycle, River b Streamflow, Groundwater movement, Water ty, Water yield, Precipitation (Atmosph Geology, Topography, Climates, Veget Stream gages, Flow characteristics, Water perature, Aquifer characteristics, Aquifers, work design.
Identifiers: *Hydrologic bench-mark network

The hydrologic bench-mark network established to provide data on stream basins are not expected to be significantly altered by Data obtained from these basins can be us document natural changes in hydrologic ch teristics with time, to provide a better under ing of the hydrologic structure of natural b and to provide a comparative base for studyi effects of man on the hydrologic environ

ere are 57 bench-mark basins in 37 States. These ins are in areas having a wide variety of climate topography. The bench-mark basins and the es of data collected are described regarding lo- on, drainage area, physiographic area, flow racteristics, climate, topography, rock type, etation, streamflow, manmade influences, am gage location, water quality, groundwater, special characteristics. (Woodard-USGS)
1-08327

TIONAL SYMPOSIUM ON DATA AND IN- RUMENTATION FOR WATER QUALITY NAGEMENT.
primary bibliographic entry see Field 05A.
1-08550

SIC DATA REQUIREMENTS TO EVALUATE TER POLLUTION IN QUALITY CONTROL OGRAMS,
S Corp., Pittsburgh, Pa. Cyrus William Rice

primary bibliographic entry see Field 05A.
1-08553

SSONS TO BE LEARNED WHEN COLLECT- VALID DATA,
hattan Coll., Bronx, N.Y. Dept. of Civil En- ering.
primary bibliographic entry see Field 05A.
1-08555

PERIENCES WITH AUTOMATION IN MOTE SAMPLING AND ANALYSIS OF SUR- CE WATERS,
erican Chain and Cable Co., Glen Cove, N.Y. tol Datamaster Div.
primary bibliographic entry see Field 05A.
1-08556

TA NEEDS IN ENGINEERING DESIGN,
graphics, Allision Park, Pa.
primary bibliographic entry see Field 05A.
1-08559

ED FOR WATER QUALITY DATA IN RATING WATER IMPOUNDMENTS,
eau of Reclamation, Washington, D.C. Div. of er and Land Operations.
primary bibliographic entry see Field 05A.
1-08560

IDAMENTALS OF SYSTEMS DESIGN,
logical Survey, Washington, D.C.
primary bibliographic entry see Field 05A.
1-08564

EMETRY - STATE-OF-THE-ART,
logical Survey, Washington, D.C.
primary bibliographic entry see Field 05A.
1-08873

IGN OF AN AUTOMATIC MONITORING TEM,
logical Survey, Austin, Tex. Water Resources

primary bibliographic entry see Field 05A.
1-08874

PERIENCES WITH OPERATING AN AUTO- TIC WATER QUALITY MONITORING TEM IN AN ESTUARINE ENVIRONMENT,
eral Water Quality Administration, Edison, Hudson-Delaware Basins Office.
primary bibliographic entry see Field 05A.
1-08875

NEW YORK STATE AUTOMATIC WATER QUALITY MONITORING SYSTEM,
New York State Dept. of Health, Albany. Water Quality Surveillance Section.
For primary bibliographic entry see Field 05A.
W71-08876

AUTOMATED STREAM QUALITY SENSING NETWORK IN NEW JERSEY,
Geological Survey, Trenton, N.J. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-08877

ORGANIZING A DATA COLLECTION PROGRAM FOR WATER RESOURCES PLANNING, DEVELOPMENT AND MANAGEMENT,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-08883

A WATER QUALITY INDEX - DO WE DARE,
National Sanitation Foundation, Ann Arbor, Mich; and Michigan Univ., Ann Arbor. School of Public Health; and Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 05A.
W71-08884

APPLICATION OF ELECTRONIC MONITORS TO RIVER QUALITY FORECASTING,
Ohio River Valley Water Sanitation Commission, Cincinnati.
For primary bibliographic entry see Field 05A.
W71-08886

POTENTIAL BENEFITS OF MATHEMATICAL MODELS AND COMPUTERS FOR WATER QUALITY MANAGEMENT PROGRAMS,
New York Univ., N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W71-08892

A PROPOSED STREAMFLOW DATA PROGRAM FOR NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
G. C. Goddard, Jr., N. M. Jackson, Jr., E. F. Hubbard, and H. G. Hinson.
Geological Survey Open-File Report, 1970. 69 p, 2 fig, 1 plate, 9 tab, 19 ref, 2 append.

Descriptors: *Streamflow, *Network design, *Stream gages, *Programs, *North Carolina, Planning, Regression analysis, Flow rates, Data collections, Flow characteristics, Flow measurement, Base flow, Peak discharge, Gaging stations, Surface waters, Equations.

The proposed streamflow data program was based on an evaluation of the present program. This evaluation included classification of data needed, the setting of accuracy goals, and the analysis of data to determine if these goals had been met and to determine in what ways the program could be strengthened. Seventeen stations on primary streams (having drainage areas greater than 500 square miles) have adequate record to define streamflow characteristics and may be discontinued. Five new stations are needed to complete the primary network. Of 175 stations in operation, 7 stations are designated as long-term and 56 as current-purpose stations. Recommendations for expanded or new hydrologic studies include: (1) determination of time of travel and dispersive characteristics of streams, (2) investigation of public water supplies, and (3) expanded study and interpretation of data collected during periods of low streamflow. (Woodard-USGS)
W71-08932

A SYSTEM FOR DETECTING FLUORESCENT TRACERS IN STREAMFLOW,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
H. W. Steppuhn.
Available from the National Technical Information Service as PB-197 866, $3.00 in paper copy, $0.95 in microfiche. PhD Thesis, December 1970, 190p, 64 fig, 11 tab, 77 ref, append. Bureau of Reclamation Contract 14-06-DO-6598.

Descriptors: Tracers, *Streamflow, Hydrologic instruments, Theoretical analysis, Diffusion, Films, Gages, Gaging stations, Chemical properties, *Hydrographs, Experimental data, *Measurement, Sorption, Bibliographies, Accuracy, Velocity, Streamflow records.
Identifiers: Stream temperature, *Fluorescent tracers.

A system to monitor continuously the relative concentration of a fluorescent tracer in streamflow was developed. Streamside instrumentation automatically registers streamborne tracer concentrations as a function of time on a gelatin-coated film. The film is routed through a device which passes a continuous sample-aliquot diverted from the tracer-dosed stream over a small segment of the film. The exposed film is gathered periodically from streamsites and analyzed in a laboratory-based fluorometer. Use of the system is studied for gaging streamflow to: (1) produce a hydrograph, (2) measure stream discharge instantaneously, and (3) determine time-of-stream-travel. Hydrographs resulting from 640 hr of gaging 2 Colorado mountain streams with the system are compared to those obtained from closely located sharp-crested weirs. The maximum instantaneous deviation between hydrographs reaches 10%, the average absolute departure equals 1.8%, and the algebraic departure averages plus 0.3%. The system can be used when an expensive, temperature-sensitive fluorometer cannot be stationed streamside, and when the particular objectives of stream measurements do not justify the cost of conventional techniques, but fair accuracy and continuous records of short to moderate duration are desired.
W71-08940

7B. Data Acquisition

A NEW SYSTEM FOR THE AUTOMATIC MEASUREMENT AND RECORDING OF RAINFALL,
Royal Aircraft Establishment, Farnborough (England).
C. F. Lucas.
Available from the National Technical Information Service as AD-714 936, $3.00 in paper copy, $0.95 microfiche. Royal Aircraft Establishment Technical Report 70051, Mar 1970. 13 p, 7 fig, 1 ref.

Descriptors: *Rain gages, *Instrumentation, Telemetry, Data storage and retrieval, Equipment, Gages, Precipitation gages, Gaging stations.
Identifiers: Rain gages (Recording).

A system was developed to meet a need for a simple, accurate, automatic recording rain gage with a high degree of reliability. It is capable of recording very light falls of rain or drizzle and of handling the heaviest falls. Also, it can store the information within the gage itself, send the information out electrically, or be interrogated by telephone or radio, or all of these. The new gage is very suitable for incorporation in automatic data logging systems, and when so used can provide an accurate combined record of the time of onset and cessation of rain, the rate of rainfall, the quantity in each shower, and total rainfall. They have an efficiency between 99% and 110% compared to the 5 inch check gage, have a much greater resolution than existing recording rain gages and can be left unattended for long periods. In addition, the total rainfall can be retained for check purposes. Evaporation is reduced considerably, no losses occur during emptying, the mechanism is generally strong, no highly toleranced or critically balanced parts are

required, and the overall cost of manufacture is low. (KnappdUSGS)
W71-08339

APPLICATION OF AERIAL PHOTOINTERPRETATION METHODS IN HYDROLOGICAL STUDIES WITH SPECIAL REFERENCE TO THE PROBLEMS IN EASTERN INDIA,
Geological Survey of India, Calcutta.
Amit Kumar Roy.
Indian Geohydrology, Vol 5, No 1, p 58-64, Dec 1969. 7 p, 7 ref.

Descriptors: *Photogrammetry, *Aerial photography, *Hydrologic data, *Data collections, Topography, Mapping, Geomorphology, Surveys, Water resources development, Reviews, Hydrology, Hydrogeology, Drainage patterns (Geologic).
Identifiers: *India.

In the major river valleys of Eastern India and in the coastal plains of West Bengal and Orissa, photogeological studies are considered very advantageous in tackling various hydroproblems. Photointerpretation methods used in hydrological studies are reviewed. Aerial photographs present a three dimensional picture of land surface, which with properly chosen scale and good resolution provides information on geomorphological features, drainage characteristics, rock and soil types, geological structures and nature and pattern of vegetation of a wide area. Demarcation of various fluviatile environments such as flood plain, backswamp, meander belt, etc. is possible on the basis of such studies. (Knapp-USGS)
W71-08341

THE USE OF WELL LOGGING IN RECHARGE STUDIES OF THE OGALLALA FORMATION,
Geological Survey, Lubbock, Tex.
For primary bibliographic entry see Field 02F.
W71-08352

UPWELLING, COLUMBIA RIVER PLUME AND ALBACORE TUNA,
Oregon State Univ., Corvallis. Dept. of Oceanography.
William G. Pearcy, and James L. Mueller.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, Vol 2, p 1101-1113, 1970. 13 p, 7 fig, 3 ref. U. S. Bur. of Commercial Fisheries. Contract No 14-17-0002-333.

Descriptors: *Columbia River, *Discharge (Water), *Pacific Ocean, *Remote sensing, Instrumentation, Aircraft, Aerial photography, Temperature, Color, Analytical techniques, Fish, Oregon, Coasts, River flow, Winds.
Identifiers: *Infrared radiometers, *Multispectral scanner, *Upwelling, *Columbia River plume.

Infrared radiometers, photographs, and a multispectral scanner, were used in a remote sensing study of the ocean off Oregon during the summer of 1969. Upwelling appeared on infrared temperature maps as a zone of cold water along the coast and Columbia River water appeared as a warm water 'plume'. Sharp temperature and color fronts were common. The areal temperature pattern was complex and changed rapidly, undoubtedly influencing the migration and distribution of albacore tuna in Oregon waters. (Woodard-USGS)
W71-08358

INFRARED EXPLORATION FOR SHORELINE SPRINGS AT MONO LAKE, CALIFORNIA, TEST SITE,
Colorado School of Mines, Golden. Dept. of Geology.
Keenan Lee.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 2, p 1075-1100, 1970. 26 p, 16 fig, 1 tab, 16 ref. USGS Contract 14-08-0001-11217.

Descriptors: *Water resources development, *Remote sensing, *Surface waters, *Lakes, Shores, Springs, Aircraft, Instrumentation, Infrared radiation, Temperature, Flow rates, Streams, Radio waves, Analytical techniques.
Identifiers: *Radiometer, Bendix scanner.

Remote sensing methods offer the potential for rapid aerial exploration for water resources. This research investigated one aspect of this potential, namely the ability of a non-classified, airborne infrared scanner to detect and evaluate shoreline springs. Infrared data were collected on four different missions using the Bendix scanner. The test site contained numerous fresh water springs of various temperatures and rates of flow which discharged around and under Mono Lake. Mono Lake is a large saline lake and was therefore analogous to a marine situation. The volumetric discharge from shoreline springs at Mono Lake can be estimated from infrared imagery if air temperature at ground-level is known. Empirically derived quantitative correlation methods, derived from a study of imagery anomalies from 7 springs, estimated the discharge rates of 11 other springs using imagery data. These methods apply to small streams as well as to shoreline springs. (Woodard-USGS)
W71-08359

THE EFFECT OF SEA ROUGHNESS ON THE BANDWIDTH OF RADAR BACKSCATTER,
Hulburt (E.O) Center for Space Research, Washington, D.C.
Donald L. Hammond.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 2, p 797-806, 1970. 10 p, 6 fig, 2 ref.

Descriptors: *Oceanography, *Remote sensing, *Radar, Surface waters, Instrumentation, Methodology, Aircraft, Data collections, Mathematical studies, Equations, Ocean waves, Computer programs.
Identifiers: *Sea roughness, Ocean surface.

The doppler signals of an eight millim aircraft radar navigation system were analyzed to determine the effect of sea roughness on the bandwidth of the radar backscatter. The ground truth giving the wave heights were obtained by estimates made by the scientists aboard the aircraft and hindcast of the sea conditions based on weather records. The results are given in terms of a factor called 'Q' which varies inversely with bandwidth and is independent of aircraft altitude and velocity. When the data are arranged in the order of increasing wave heights, there is a trend of decreasing 'Q' with increasing wave height. (Woodard-USGS)
W71-08360

DETECTION OF OIL SLICK POLLUTION ON WATER SURFACES WITH MICROWAVE RADIOMETER SYSTEMS,
Microwave Sensor Systems, Inc., Downey, Calif.; and California Univ., Santa Barbara.
For primary bibliographic entry see Field 05A.
W71-08361

OCEANOGRAPHIC APPLICATIONS OF REMOTE SENSING WITH PASSIVE MICROWAVE TECHNIQUES,
Aerojet-General Corp., El Monte, Calif
A. T. Edgerton, and D. T. Trexler.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 2, p 767-788, 1970. 22 p, 16 fig, 8 ref.

Descriptors: *Oceanography, *Remote sensing, *Microwaves, *Radio waves, Methodology, Aircraft, Oceans, Pollutant identification, Water temperature, Salinity, Sea ice, Sea spray, Oil-water interfaces, Surface waters, Ocean waves.
Identifiers: *Microwave radiometry, *Sea roughness, Ocean surface.

Passive remote sensing in the microwave spectral region is a useful tool for determination of oceanographic phenomena such as sea state, pollution and sea ice characteristics. Differences in radiometric brightness temperature of the sea surface on the order of 15 deg K have been readily detected during airborne measurements of the Salton Sea, California and the North Atlantic. Oil based pollutants on the ocean surface radically affect the radiometric response because of the distinctly different dielectric properties of the oil as compared to water. Salinity variations in sea water between 30,000 and 35,000 ppm are detectable with long wavelength radiometers. Another application of microwave radiometry is the delineation of various sea ice types based on surface roughness, thermal gradient in the ice, and the presence or absence of brine pockets. (Woodard-USGS)
W71-08362

MULTISPECTRAL SENSING OF OIL POLLUTION,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 05A.
W71-08363

THE REMOTE SENSING OF THE SEA AND SEA ICE,
Naval Research Lab., Washington, D.C.
N. W. Guinard.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 2, p 731-754, 1970. 18 p, 12 fig, 1 tab, 9 ref.

Descriptors: *Oceanography, *Remote sensing, *Data collections, *Radar, *Atlantic Ocean, Aircraft, Sea ice, Sea water, Surface waters, Ocean waves.
Identifiers: *Sea roughness, Ocean surface.

The Naval Research Laboratory has developed a unique data collection facility, the Four-Frequency Radar (4FR) System which is an experimental radar installed in an EC-121 (Super Constellation) aircraft. The system has a wavelength capability spanning the range from UHF to X band, with linear polarization diversity, pulsewidth and repetition rate flexibility and the ability to illuminate the rain and targets at various angles of incidence and with near simultaneity. This system was used to measure the radar returns scattered from both sea and ice surfaces both for the purpose of identifying sea states and ice types and to determine effective models of the scattering processes to aid in the design of optimum sensors. Data collected over the ocean in low sea states at Puerto Rico and in the higher sea states observed in the North Atlantic were used to verify the predictions of the slight rough surface model. Polar ice was mapped in synthetic aperture mode to determine roughness and contour. Some penetration effects are noted. (Woodard-USGS)
W71-08364

REMOTE SENSING OF THE SEA CONDITION WITH MICROWAVE RADIOMETER SYSTEMS,
Microwave Sensor Systems, Inc., Downey, Calif. and RCA Corp., Princeton, N.J.
J. C. Aukland, P. J. Caruso Jr., W. H. Conway, and R. G. Groshans.
Proceedings 6th International Symposium on Remote Sensing of Environment, Michigan University, Ann Arbor, Oct 13-16, 1969, Vol 2, p 705-719, 1970. 11 p, 5 fig, 3 tab, 3 ref.

Descriptors: *Oceanography, *Remote sensing, *Instrumentation, *Data collections, Meteorology, Mathematical studies, Water temperature, Aircraft, Radio waves, Microwaves, Radiation, Atmospheric physics, Surface waters, Ocean waves.
Identifiers: *Sea roughness, Ocean surface.

Information about the condition of the sea surface is of major importance to shipping, fishing, naval operations. Likewise, other oceanographic activities and meteorological analyses and forec

quire sea surface data across the full expanse of e oceans. Two of the important parameters are state and sea-surface temperature. A crowave radiometric experimental program is cussed. The purpose of the program was to nerate curves relating sea state and sea-surface nperature to apparent radiometric temperatures, oviding the basic data to be used with remote crowave radiometric measurements for deter-ning sea state and sea-surface temperature. The ound based measurements indicate that foam and face ripple must be considered in any system asuring sea state or sea temperature. The esence of foam significantly modifies the iometric temperature by 20 - 100 deg, depend- upon the quantity of foam in the beam. The asurements further point out the need for air-ne measurements to generate curves for sea te determination. (Woodard-USGS)
1-08365

ME-SPACE VARIATIONS OF THE GULF REAM AS OBSERVED BY AIRBORNE MOTE SENSING TECHNIQUES,
val Oceanographic Office, Washington, D.C.
. Wilkerson, and V. E. Noble.
ceedings 6th International Symposium on mote Sensing of Environment, Michigan Univer-, Ann Arbor, Oct 13-16, 1969, Vol 2, p 671-, 1970. 38 p, 16 fig, 2 tab, 5 ref.

scriptors: *Ocean circulation, *Ocean currents, tlantic Ocean, *Gulf of Mexico, *Tracking hniques, Remote sensing, Water temperature, craft, Bathythermographs, Data collections, thodology, Isotherms, Surface waters.
ntifiers: *Gulf streams, Time-space variations.

ring May to July 1969, 22 aerial surveys of the lf Stream were made. During the tracking mis-ns, the significant sea surface temperature front ineating Gulf Stream water from Slope Water ually defined by the surface packing of the 21 - deg C isotherms) was located with a remote sing radiation thermometer. Starting at the east st between longitudes 75 deg W and 73 deg W, boundary was tracked downstream to lon-ides between 65 deg W and 60 deg W. During iods of rapid motions of the meanders of the f Stream, some segments of the surface tem-ature front defining its position moved as much 0 km/day. Bathythermograph data showed that surface position being rracked during flight was allel to and, in general, 20-50 km shoreward of Gulf Stream position at the 200-meter depth. In region, Gulf Stream water overran Slope ter, producing very shallow layer depths usually than 20 meters. (Woodard-USGS)
1-08366

MOTE SENSING IN SOUTH DAKOTA.
th Dakota State Univ., Brookings.

th Dakota Farm and Home Research, Vol 20, 1, Winter 1969, p 9-11, 36. 4 fig.

criptors: *Remote sensing, *Land classifica-, *Resource planning, *Aerial photography, p response, Plant diseases, Insect behavior, ter management (Applied), Geological studies, th Dakota, Soil-water-plant relationships, Soil eys, Analysis, Soil moisture, Salinity, Moisture ss, Fertilization, Irrigation practices, Mapping, types.
ntifiers: *Condition mapping, *Crop surveys, ch elm disease, Wheat rust.

institute of remote sensing was established at th Dakota State University for Dutch elm dis-detection, wheat rust and other plant or insect s detection, land classification, moisture and ir-tion surveys. Computer-oriented data will be l for agricultural research, resource planning management. The U.S. Department of Interior support hydrologic and geologic studies. The Department of Agriculture will support crop soil investigations. A twin-engined airplane will take aerial photographs from 3,000 to 10,000 feet, which will be interpreted by specialists. NASA aircraft equipment will be used to map soil moisture, land classification, irrigation and salinity, plant stress and pollution. Fertilization and irrigation practices may be better managed by 'condition mapping' of the land resource. Four photographs show tree disease infection, aircraft instrumentation, soil types, and mosquito surveys. (Popkin-Arizona)
W71-08487

THE ACOUSTIC STREAMFLOW-MEASURING SYSTEM ON THE COLUMBIA RIVER AT THE DALLES, OREGON,
Geological Survey, Portland, Oreg.
Winchell Smith, Larry L. Hubbard, and Antonius Laenen.
Geological Survey Open-file Report, Jan 1971. 60 p, 32 fig, 5 tab, 10 ref.

Descriptors: *Flowmeters, *Streamflow, *Acoustics, *Columbia River, *Oregon, Methodology, Equipment, Instrumentation, Stream gages, Discharge measurement, Flow rates, Dams, Non-uniform flow.
Identifiers: *The Dalles (Oreg), *Acoustic velocity meter.

Because dams control watersurface elevations in the Columbia River from Bonneville Dam to the Canadian border, conventional stream-gaging methods, used historically, are no longer adequate. An acoustic streamflow-measuring system in the river channel at The Dalles, Oreg, provides an index of water velocity by measuring the difference in travel times of acoustic pulses transmitted through the water in each direction along a diagonal path across the river. The flow of water along the path increases the speed of one signal and retards the speed of the other. The difference in time of travel is related linearly to the water velocity along the path. The velocity index and river stage are used as a two-variable index in the computation of flow. These variables, correlated against current-meter measurements made with specialized boat equipment, provide a reliable basis for computations of instantaneous and daily mean discharges. This report covers the general theory behind acoustic velocity meters. Conclusions are that the AVM can now be considered as an operational instrument which permits accurate gaging of river discharge at many sites where conventional stream-gaging procedures have proved to be unreliable. (Woodard-USGS)
W71-08522

OPEN-CHANNEL INTEGRATING-TYPE FLOW METER,
Geological Survey, Albuquerque, N. Mex.
F. C. Koopman.
Geological Survey Open-file Report, Apr 1971. 25 p, 5 fig, 3 tab, 2 ref.

Descriptors: *Flowmeters, *Flow measurement, Flow rates, Instrumentation, Gages, Water measurement, Electrolysis.
Identifiers: *Flowmeters (Integrating).

A relatively inexpensive meter was developed for measuring cumulative flow in open channels with a rated control. It translates the nonlinear function of gage height to flow by use of a cam and a float. A variable resistance element in an electronic circuit is controlled by the float so that the electric current in the circuit corresponds to the flow of water. The flow of electricity causes electroplating with silver; the amount of silver deposited is proportionate to the total flow of water. A device was developed to measure the total amount of silver electrolytically. (Knapp-USGS)
W71-08525

EXPERIENCES WITH AUTOMATION IN REMOTE SAMPLING AND ANALYSIS OF SURFACE WATERS,
American Chain and Cable Co., Glen Cove, N.Y. Bristol Datamaster Div.
For primary bibliographic entry see Field 05A.
W71-08556

PYROGRAPHIC GROSS CHARACTERIZATION AND MONITORING OF WATER POLLUTANTS,
Rocketdyne, Athens, Ga. Southeast Field Lab.
For primary bibliographic entry see Field 05A.
W71-08561

APPLICATION OF REMOTE SENSING TO WATER QUALITY MANAGEMENT,
Ecology and Environment, Inc., West Seneca, N. Y.
For primary bibliographic entry see Field 05A.
W71-08562

ORGANIZING A DATA COLLECTION PROGRAM,
Bureau of Reclamation, Sacramento, Calif.
For primary bibliographic entry see Field 05A.
W71-08565

COMPATIBILITY OF SYSTEMS AND INTERCHANGE OF DATA,
Geological Survey, Washington, D.C. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-08566

EXPERIENCES WITH A WATER POLLUTION CONTROL STORAGE AND RETRIEVAL SYSTEM (STORET),
Federal Water Quality Administration, Washington, D. C. Pollution Surveillance Branch.
For primary bibliographic entry see Field 05A.
W71-08567

EXPERIENCE WITH STORAGE AND RETRIEVAL OF GROUNDWATER DATA,
Geological Survey, Washington, D. C. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-08568

A WATER QUALITY STORAGE AND RETRIEVAL SYSTEM FOR REGIONAL APPLICATION,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 05A.
W71-08569

PROJECT HYDRA,
John N. Spinning.
Military Engineer, Vol 63, No 412, p 82-84, Mar-Apr 1971. 3 p, 4 fig.

Descriptors: *Surveys, *Hydrography, *Telemetry, *Instrumentation, *Mapping, *Measurement, Sounding, Oceanography, Bathymetry, Profiles, Terrain analysis, Topography, Automation.
Identifiers: *Automatic survey systems.

The HYDRA Survey System was developed for use in river, harbor, and near-shore surveys. Such marine areas often present difficult survey problems because of unusual local conditions or logistic support limitations. The new system provides the user with maximum mobility, yet requires the minimum of logistic support. The HYDRA Survey System is a lightweight, portable, digital hydrographic data acquisition package suitable for temporary installation aboard a wide variety of craft without modification to either the equipment or survey platform. Thus it permits use of indigenous craft or standard survey launches. Survey data con-

sisting of electronic coordinates and water depths correlated with the time of day are recorded on magnetic tape aboard the survey vehicle. (Knapp-USGS)
W71-08614

BIOGEOCHEMISTRY OF A RESERVOIR ECOSYSTEM,
Oklahoma State Univ., Stillwater. Dept. of Chemistry; and Oklahoma State Univ., Stillwater. Dept. of Zoology; and Oklahoma State Univ., Stillwater. Reservoir Research Center.
For primary bibliographic entry see Field 05A.
W71-08685

OIL POLLUTION DETECTION AND DISCRIMINATION BY REMOTE SENSING TECHNIQUES,
Spectran, Inc., Buena Park, Calif. Microwave Sensor Systems Div.
For primary bibliographic entry see Field 05A.
W71-08745

AERIAL PHOTOGRAPHIC STUDIES OF THE COASTAL WATERS OF NEW YORK AND LONG ISLAND,
Virginia Univ., Charlottesville. Dept. of Environmental Science; New York Univ., Bronx. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-08746

TELEVISION - A NEW TOOL FOR THE GROUNDWATER GEOLOGIST,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W71-08815

PULP MILL OUTFALL ANALYSIS BY REMOTE SENSING TECHNIQUES,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-08829

AN AERIAL PHOTOGRAPHIC STUDY OF WASTE FIELD FROM THREE OCEAN OUTFALLS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-08831

THE USE OF PHOTOGRAMMETRY IN PREDICTING OUTFALL DIFFUSION,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W71-08832

AN INFRARED DE-ICING UNIT FOR CUP ANEMOMETERS,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colo.
Arthur Judson.
USDA Forest Serv Res Note RM-187, 1971. 4 p, illus.

Descriptors: *Instrumentation, *Anemometers, Deicers, Colorado.
Identifiers: *Mountain winds, *Icing, Severe weather.

Electric infrared lamps yielding 0.5 watt radiant energy per square centimeter of cup surface prevented icing on an exposed mountain anemometer in Colorado. The unit performed well during all rime conditions for two consecutive winters. Parts for the inexpensive unit are commercially available.
W71-08846

USE OF RADIOISOTOPES IN TRACING RESERVOIR LEAKAGE AT ANCHOR DAM,
Bureau of Reclamation, Denver, Colo. Chemical Engineering Branch.
For primary bibliographic entry see Field 08B.
W71-08863

SENSORS - STATE-OF-THE-ART,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-08872

ESTIMATING EVAPOTRANSPIRATION - AN EVALUATION OF TECHNIQUES.
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 02D.
W71-08930

7C. Evaluation, Processing and Publication

WATER RESOURCES DATA FOR COLORADO, 1969: PART 2. WATER QUALITY RECORDS.
Geological Survey, Denver, Colo.

Copies of report may be obtained from District Chief, Water Resources Division, US Geological Survey, Denver Federal Center, Denver, Colorado, 80225. Geological Survey Duplicated Basic Data Report, 1971. 83 p, 1 fig.

Descriptors: *Water quality, *Hydrologic data, *Data collections, *Surface waters, *Colorado, Chemical analysis, Streams, Stream gages, Streamflow, Discharge measurement, Sediment transport, Bed load, Sediments, Particle size, Water temperature, Irrigation water, Gaging stations, Bench marks.
Identifiers: *Water quality records.

Water quality data for surface waters in Colorado for the 1969 water year are presented. Data for a few water quality stations in bordering States are also included. Water quality information is presented for chemical quality, fluvial sediment, and water temperatures. The chemical quality includes concentrations of individual dissolved constituents and certain properties or characteristics such as hardness, sodium-absorption-ratio, specific conductance, and pH. Fluvial sediment information is given for suspended-sediment discharges and concentrations and for particle size distribution of suspended sediment and bed material. Water temperature data represent once-daily observations except for stations where a continuous temperature recorder furnishes information from which daily minimums and maximums are obtained. Data collected at the irrigation network stations are used to evaluate the chemical quality of surface waters used for irrigation and the changes resulting from the drainage of irrigated lands. (Woodard-USGS)
W71-08324

FLOODS IN WILMINGTON QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
Howard E. Allen, and Allen W. Noehre.
For sale by US Geological Survey, Washington, DC, 20242, Price $0.75. Geological Survey Hydrologic Investigations Atlas HA-306, 1 sheet, 1971. Text, 9 fig, 1 map, 2 tab, 2 ref.

Descriptors: *Floods, *Flood plains, *Hydrologic data, *Flood control, *Illinois, Streamflow, Flow characteristics, Runoff, Discharge measurement, Stream gages, Peak discharge, Planning, Flood protection, Flood forecasting, Hydrographs.
Identifiers: *Flood measurements, Flood profiles.

This one-sheet atlas contains 12 illustrations and a text concerning hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Wilmington quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood plain regulations that will minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to groundwater resources. The areas inundated by floods along streams in the Wilmington 7.5 minute quadrangle are delineated on a topographic map. (Woodard-USGS)
W71-08332

HYDROGEOLOGIC CHARACTERISTICS OF THE VALLEY-FILL AQUIFER IN THE ARKANSAS RIVER VALLEY, BENT COUNTY, COLORADO,
Geological Survey, Denver, Colo.
R. Theodore Hurr, and John E. Moore.
Geological Survey Open-file Report, Mar 1971. p, 4 fig, 11 ref.

Descriptors: *Hydrogeology, *Alluvium, *Surface groundwater relationships, Groundwater, Water table, Bedrock, Saturated flow, Transmissivity, Irrigation wells, Water utilization, Colorado.
Identifiers: Arkansas River valley, Bent County (Colo), Saturated thickness.

Irrigation wells in a 36-mile reach of the Arkansas River Valley in Bent County, Colo., tap a valley-fill aquifer that occurs in unconsolidated clay, silt, sand, gravel deposits. The aquifer ranges from 0 to 200 feet thick and 1 to 5 miles wide. The Arkansas River is a natural drain for the aquifer and is hydraulically connected with it. The yields of irrigation wells range from 100 gallons per minute to 2,500 gallons per minute. The transmissivity of the aquifer is as much as 40,100 square feet per day. The atlas contains maps at a scale of 1:62,500 showing saturated thickness, configuration of the bedrock, depth to water, water-table contours, and transmissivity of the valley-fill aquifer. The transmissivity map was used to construct electric analog and digital models of the Arkansas River valley. (Lang-USGS)
W71-08333

FLOODS IN HUNTLEY QUADRANGLE, NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
Gerald L. Walter, and Roman T. Mycyk.
For sale by US Geological Survey, Washington, DC, 20242, Price $0.75. Geological Survey Hydrologic Investigations Atlas HA-361, 1 sheet, 1971. Text, 8 fig, 1 map, 3 tab, 2 ref.

Descriptors: *Floods, *Illinois, Maps, Profiles, Mapping, Flood forecasting, Frequency analysis, Stage-discharge relations, Data collection, Hydrologic data, Runoff.
Identifiers: Huntley (Ill).

This 1-sheet hydrologic atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Huntley quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and formulating effective flood-plain regulations that will minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to the groundwater resources. The approximate areas inundated by floods along streams in the Huntley quadrangle are delineated on a topographic map. Frequency of floods at the Geological Survey gaging station at Nippersink Creek near Huntley, Ill., was derived from streamflow records of this station combined with records for other nearby stations and with the regional flood-frequency relation for streams in North Illinois. Profiles of the water surface for the floods of February 1966 and June 1967 are shown. (Knapp-USGS)

/71-08334

LOODS IN HEBRON QUADRANGLE, ORTHEASTERN ILLINOIS,
eological Survey, Washington, D.C.
oward E. Allen, and R. Stephen Grant.
or sale by US Geological Survey, Washington, C, 20242, Price $1.00. Geological Survey ydrologic Investigations Atlas HA-363, 1 sheet, 971. Text, 10 fig, 1 map, 2 tab.

escriptors: *Floods, *Illinois, Maps, Profiles, apping, Flood forecasting, Frequency analysis, age-discharge relations, Data collections, ydrologic data, Runoff.
entifiers: Hebron (Ill).

his 1-sheet hydrologic atlas presents hydrologic ta that can be used to evaluate the extent, depth, d frequency of flooding that affect the economic velopment of flood plains in the Hebron adrangle, northeastern Illinois. It will aid inviduals, government agencies, and others responble for solving existing flood problems and for forulating effective flood-plain regulations that will inimize the creation of new flood problems. The port will also be useful for preparing building and ning regulations, locating waste disposal facilis, developing recreational areas, and managing rface water in relation to the groundwater sources. The areas inundated by floods along reams in the Hebron quadrangle are delineated a topographic map. Inundated areas are shown ong Nippersink Creek, De Young Creek, Newan Creek, North Branch Nippersink Creek, and veral unnamed streams for the flood of July 38, along Slough Creek for the flood of March 43, and along Silver Creek and Vander Karr eek for the flood of June 1967. Local residents ported that the flood of July 1938 was the highest served in the past 70 years on Nippersink Creek. ofiles of the water surface for the floods of July 38, March 1943, February 1966, and June 1967 e shown. Depth of flooding at any point can be timated by subtracting the ground elevation from e water-surface elevation at the same point, incated by the profiles. (Knapp-USGS)
71-08335

LOODS IN VICINITY OF ELLIJAY, GEORA,
eological Survey, Washington, D.C.
cGlone Price.
r sale by US Geological Survey, Washington, C, 20242, Price $0.75. Geological Survey drologic Investigations Atlas HA-418, 1 sheet, 71. Text, 7 fig, 2 map, 2 ref.

escriptors: *Floods, *Georgia, Maps, Profiles, apping, Flood forecasting, Frequency analysis, age-discharge relations, Data collections, drologic data, Runoff.
ntifiers: Ellijay (Ga).

is 1-sheet hydrologic atlas presents hydrologic ta that can be used to evaluate the extent, depth, d frequency of flooding that may be expected on e Coosawattee, Cartecay, and Ellijay Rivers in e vicinity of Ellijay, Ga. The technical informan provided will aid in reaching decisions for ind economic management of flood-plain areas. e areas inundated by floods having recurrence ervals of 5, 25, and 50 years are shown on a pographic map, and the flood boundaries were termined for the present (1969) channel condins. The general procedure used in delineating e flood boundaries for the 5-, 25-, and 50-year ods was to construct flood profiles based on p-backwater studies and on floodmarks ntified in the field. Frequency of flooding at the ging stations on Cartecay River near Ellijay, Ely River at Ellijay, and Coosawattee River near ijay was derived from a statistical evaluation of nual flood peaks. Profiles of the water surface of osawattee, Cartecay, and Ellijay Rivers are own for hypothetical floods of 5-, 25-, and 50ar recurrence intervals. (Knapp-USGS)
71-08336

FLOODS IN THE YABUCOA AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
Fred K. Fields.
For sale by US Geological Survey, Washington, DC, 20242, Price $1.00. Geological Survey Hydrologic Investigations Atlas HA-382, 1 sheet, 1971. Text, 6 fig, 1 map, 1 tab.

Descriptors: *Floods, *Puerto Rico, Maps, Profiles, Mapping, Flood forecasting, Frequency analysis, Stage-discharge relations, Data collections, Hydrologic data, Runoff.
Identifiers: Yabucoa (Puerto Rico).

The lower Rio Guayanes basin is virtually unprotected from high-magnitude floods. Two such floods occurred during the period 1936-60. This 1-sheet hydrologic atlas provides factual and interpretive information to aid the planner, designer, or any other interested person to reach rational decisions related to land use in the flood plain of the lower Rio Guayanes basin. Among the data presented are stream flood profiles and the area of inundation for the September 6, 1960, flood. Major floods are known to have occurred in 1931, 1936, 1945, 1952, 1956, 1960, and 1961. The largest floods of this group are those of May 20, 1936, and September 6, 1960. Current-meter measurements of Rio Guayanes made at Highway PR-3 define the stage-discharge relation from 30 to 1,200 cfs. The U.S. Soil Conservation Service has estimated the discharge of the 1960 flood at the valley cross section along Highway PR-3 to be 40,000 cfs. The area of inundation that resulted from floodflow in the lower Rio Guayanes basin is delineated on the topographic map. (Knapp-USGS)
W71-08337

FLOODS IN CHANNAHON QUADRANGLE NORTHEASTERN ILLINOIS,
Geological Survey, Washington, D.C.
Howard E. Allen, and Allen W. Noehre.
For sale by US Geological Survey, Washington, DC, 20242, Price $1.00. Geological Survey Hydrologic Investigations Atlas HA-362, 1 sheet, 1971. Text, 10 fig, 1 map, 2 tab, 4 ref.

Descriptors: *Floods, *Illinois, Maps, Profiles, Mapping, Flood forecasting, Frequency analysis, Stage-discharge relations, Data collections, Hydrologic data, Runoff.
Identifiers: Channahon (Ill).

This 1-sheet hydrologic atlas presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Channahon quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood-plain regulations that will minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to groundwater resources. The areas inundated by floods along streams in the Channahon 7 1/2-minute quadrangle are delineated on a topographic map. Local residents reported that the flood of July 1957 was the highest observed in the past 50 years on Jackson Creek. This flood had a 40-year recurrence interval at the Du Page River gaging station. Profiles of the water surface, based primarily on elevations of marks left by the floods of October 1954, July 1957, and May 1966 are shown. Depth of flooding at any point can be estimated by subtracting the ground elevation from the water-surface elevation at the same point, indicated by the profiles. (Knapp-USGS)
W71-08338

INTERNATIONAL HYDROLOGICAL DECADE YEARBOOK OF THE FEDERAL REPUBLIC OF GERMANY-CALENDAR YEAR 1967.

Federal Republic of Germany 1967 International Hydrological Decade Yearbook, Coblenz, 1970. 138 p, 72 ref.

Descriptors: *International hydrological decade, *Hydrologic data, *Data collections, *Reviews, Surface waters, Stream gages, Groundwater, Water quality, Water yield, Streamflow, Runoff, Water levels, Hydrogeology, Soil moisture, Meterological data, Sediment transport, Water temperature, Water pollution, Evaporation, Water balance.
Identifiers: *Index (Hydrologic data), *IHD Yearbook, *Federal Republic of Germany.

This International Hydrological Decade yearbook contains information concerning hydrologic data collected in the Federal Republic of Germany during 1967. The location, description, and index of data collection stations along with related information are presented for the following programs: (1) Water Stage, Discharge, Suspended Matter Load, Dissolved Load and Temperature of River Waters; (2) Chemistry and Biology of River Waters; (3) Radioactivity of River Waters; (4) Groundwater Level; (5) Soil Moisture, Evaporation and Infiltration; and (6) Meteorological Data. (Woodard-USGS)
W71-08346

MATHEMATICAL MODELS OF STREAMFLOW TRANSFORMATION AND METHODS OF DETERMINING THEIR PARAMETERS (RUSSIAN: MATEMATICHESKIYE MODELI PROTESSA TRANSFORMATSII RECHNOGO STOKA I METODY OPREDELENIYA IKH PARAMETROV),
For primary bibliographic entry see Field 02E.
W71-08373

NUMERICAL SIMULATION OF WATERSHED HYDROLOGY,
Texas Univ., Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02A.
W71-08392

WATER RESOURCE SYSTEM OPTIMIZATION BY GEOMETRIC PROGRAMMING,
Texas A and M Univ., College Station.
For primary bibliographic entry see Field 06A.
W71-08393

SURFACE WATER DATA--ATLANTIC PROVINCES, 1968.
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.

Canada Department of Energy, Mines and Resources, Inland Waters Branch Water Survey of Canada Report, 1971. 152 p.

Descriptors: *Streamflow, *Hydrologic data, *Data collections, *Stream gages, *Flow rates, Gaging stations, Flow measurement, Average flow, Low flow, Peak discharge, Discharge measurement, Runoff.
Identifiers: *Canada, Atlantic Provinces (Canada).

Streamflow data are presented for 158 sites in Newfoundland and Labrador, New Brunswick, Nova Scotia, and Prince Edward Island for the period October 1967 to December 1968. The tables of data include a description of the gaging station and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, extremes of discharge and general remarks. This report is one of a series containing hydrometric survey data for the Atlantic Provinces of Canada. (Woodard-USGS)
W71-08524

WATER RESOURCES OF THE RIVER ROUGE BASIN, SOUTHEASTERN MICHIGAN,
Geological Survey, Washington, DC.
R. L. Knutilla.
For sale by US Geological Survey, Washington, DC 20242 - price $1.50 per set. Geological Survey Hydrologic Investigations Atlas HA-356, 2 sheets, 1971. Text, 19 fig, 7 map, 2 tab.

Descriptors: *Water resources development, *Michigan, Streamflow, Groundwater, Water quality, Urbanization, Water pollution, Cities, Water yield, Runoff, Hydrologic data, Data collections, Maps, Surveys, Lakes.
Identifiers: *Detroit (Mich), *River Rouge (Mich).

This 2-sheet hydrologic atlas represents a part of a comprehensive study of the water resources of southeastern Michigan. Its purpose is to provide information on (1) the physical features of the River Rouge and its tributaries, (2) the characteristics of streamflow, (3) the quality of ground and surface water, and (4) the availability of the groundwater. The River Rouge basin, a triangular area of 467 square miles, is characterized by hilly or moderately undulating topography in the north and west and by relatively flat land to the southeast. Larger streams in the basin flow through well defined valleys having gradually sloping banks which are from 20 to 30 feet above the valley floor. In areas of intensive urbanization natural drainage patterns have been altered by ditches and drains constructed of storm sewers. There are 404 lakes and ponds in the basin ranging in size from less than an acre to the 670 acres in Walled Lake. The River Rouge basin lies within the Detroit Metropolitan area and, except for isolated areas, the basin has been urbanized. In much of the basin population densities are among the highest in the state. In the River Rouge basin water is relatively uniform in quality and, except for that obtained from bedrock, is chemically suitable for most municipal, agricultural and industrial supplies. Small to moderate quantities of water are available nearly everywhere in the River Rouge basin from wells completed in the glacial drift or bedrock aquifers. Wells drilled in bedrock usually yield water that is too highly mineralized for most uses. (Knapp-USGS)
W71-08535

FLOODS IN THE ANASCO AREA, PUERTO RICO,
Geological Survey, Washington, D.C.
Fred K. Fields.
For sale by US Geological Survey, Washington, DC 20242-price 75 cents. Geological Survey Hydrologic Investigations Atlas HA-375, 1 sheet, 1971. Text, 6 fig, 1 map, 2 tab.

Descriptors: *Floods, *Puerto Rico, Maps, Profiles, Mapping, Flood forecasting, Frequency analysis, Stage-discharge relations, Data collections, Hydrologic data, Runoff.
Identifiers: Anasco (Puerto Rico).

This 1-sheet hydrologic atlas provides factual and interpretive information to be used by the planner, designer, or any interested person, to reach more rational decisions related to land use in the flood plain of the lower reaches of Rio Grande de Anasco, Puerto Rico. Among the data presented are tabulations of flood stages, stream-flood profiles, and area of inundation for the flood of September 13, 1928, on Rio Grande de Anasco, and the area inundated in the vicinity of Anasco by floodwaters of Rio Daguey on August 12, 1956. Stage-frequency curves are presented from which the magnitude of future floods of selected recurrence interval can be estimated. Areas of inundation and flood profiles are specifically for valley conditions that existed at the time of the floods. The flood plain of the lower Rio Grande de Anasco has been inundated extensively at least four times during the period 1899-1967. The greatest flood known occurred August 8, 1899. The second greatest flood was that of September 13,1928. Other major floods occurred on September 26, 1932, and September 23, 1952. The peak discharge of the 1928 flood on Rio Grande de Anasco was computed as 35,000 cfs on the basis of the high-water profile and the channel geometry in the vicinity of El Espino. The inundated area was defined on the basis of flood-stage information furnished by local residents. The estimated water-surface contours for the flood of September 13, 1928, are shown on the topographic map. (Knapp-USGS)
W71-08536

WATER QUALITY INFORMATION SYSTEMS, THE KEY TO CLEANER WATERS,
Pennsylvania Dept. of Health, Harrisburg. Bureau of Sanitary Engineering.
For primary bibliographic entry see Field 05A.
W71-08551

COORDINATION - THE KEY TO EFFECTIVE WATER DATA MANAGEMENT,
Geological Survey, Washington, D.C. Office of Water Data Coordination.
For primary bibliographic entry see Field 05A.
W71-08552

BASIC DATA REQUIREMENTS TO EVALUATE WATER POLLUTION IN QUALITY CONTROL PROGRAMS,
NUS Corp., Pittsburgh, Pa. Cyrus William Rice Div.
For primary bibliographic entry see Field 05A.
W71-08553

LESSONS TO BE LEARNED WHEN COLLECTING VALID DATA,
Manhattan Coll., Bronx, N.Y. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05A.
W71-08555

FORECASTING OF WATER QUALITY DATA IN THE DELAWARE RIVER ESTUARY,
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 05A.
W71-08557

NEED FOR WATER QUALITY DATA IN PLANNING WATER RESOURCE DEVELOPMENTS,
Geological Survey, Lincoln, Nebr. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-08558

PROJECT HYDRA,
For primary bibliographic entry see Field 07B.
W71-08614

ERRORS TO AVOID IN WATER QUALITY COLLECTION AND SAMPLING,
Bureau of Reclamation, Sacramento, Calif.
For primary bibliographic entry see Field 05A.
W71-08878

ERRORS TO AVOID IN COLLECTION AND SAMPLING,
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 05A.
W71-08879

ON THE ANALYSIS AND USE OF WATER QUALITY DATA,
Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05A.
W71-08882

MINICOMPUTERS AND WATER QUALITY SURVEILLANCE,
Minneapolis-St. Paul Sanitary District, St. Paul, Minn.
For primary bibliographic entry see Field 05A.
W71-08888

THE WATER MANAGEMENT INFORMATION SYSTEM (WAMIS),
Spindletop Research, Inc., Lexington, Ky.
For primary bibliographic entry see Field 05A.
W71-08889

EXPERIENCE WITH COMPUTER USE IN MANAGING WATER QUALITY DATA IN THE DELAWARE RIVER BASIN,
Geological Survey, Philadelphia, Pa.
For primary bibliographic entry see Field 05A.
W71-08890

BENEFICIAL USES AND PITFALLS O HISTORICAL WATER-QUALITY DATA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-08891

HYDROLOGIC DATA UTILIZATION I FORECASTING THE SPRING 1969 MIDWES SNOWMELT FLOODS,
Environmental Science Services Administratio Kansas City, Mo., Weather Bureau River Foreca Center.
For primary bibliographic entry see Field 02E.
W71-08893

COMPUTERIZED PROGRAMS FO MICHIGAN'S WATER MANAGEMEN SYSTEM,
Michigan Water Resources Commission, Lansi and Ernst and Ernst, Detroit, Mich.
For primary bibliographic entry see Field 05A.
W71-08894

ANNUAL COMPILATION AND ANALYSIS HYDROLOGIC DATA FOR ESCONDI CREEK, SAN ANTONIO RIVER BASIN, TEXA -1969,
Geological Survey, Austin, Tex.
D. R. Reddy.
Geological Survey Data Report, Feb 1971. 62 p fig, 3 tab.

Descriptors: *Streamflow, *Rainfall-runoff r tionships, *Data collections, *Hydrologic d *Texas, Small watersheds, Flow measureme Stream gages, Flow characteristics, Flow ra Hydrographs, Mass curves, Floods, Water measurement.
Identifiers: *Runoff computations, *Escond Creek (Tex), Water budget, Flood-retarding st tures.

This report, which is the ninth in a series of ba data reports published annually for the Escon Creek study area, contains the rainfall, runoff, storage data collected during the 1969 water (Oct. 1968 - Sept. 1969) for the 72.4-square- area above stream-gaging station Escondido C at Kenedy, Texas. The location of floodwate tarding structures and hydrologic instrument the area are shown. The mean annual rai (1931-60) at Karnes City is 31.93 inches. weighted-mean rainfall over the study area fo 1969 water year was 28.31 inches, or 97 perce the 15-year average of 29.06 inches. Monthly fall ranged from 0.39 inch in December to inches in April. Mean daily discharge at the str gaging station was 12.1 cfs, compared with th year average of 14.3 cfs. Annual runoff a stream-gaging station was 8,760 acre-feet, or inches. For the 1969 water year four storms selected for detailed computations. These co tations include detailed time breakdown of ra and discharge. Hydrographs and mass curve drawn for illustrations. (Woodard-USGS)
W71-08903

ANNUAL COMPILATION AND ANALYSIS HYDROLOGIC DATA FOR GREEN CR BRAZOS RIVER BASIN, TEXAS--1969,
Geological Survey, Austin, Tex.
B. C. Massey.
Geological Survey Data Report, 1970. 44 p, 2 tab.

Descriptors: *Streamflow, *Rainfall-runoff tionships, *Data collections, *Hydrologic *Texas, Small watersheds, Flow measuren

low characteristics, Flow rates, Hydrographs, lass curves, Stream gages, Rain gages, Floods, eak discharge, Watershed management.
lentifiers: *Runoff computations, *Green Creek Tex), Water budget, Flood-retarding structures.

his report which is the tenth in a series of basic-ta reports published annually for the Green reek study area, contains the rainfall, runoff, and orage data collected during the 1969 water year Oct. 1968 - Sept. 1969) for the 46.1-square-mile ea above the stream-gaging station Green Creek ar Alexander, Texas. The locations of the flood-ater-retarding structures and hydrologic instru-ents in the area are shown. The weighted-mean infall was 31.01 inches, or 98 percent of the 931-60 long-term mean annual rainfall of 31.67 ches in Dublin, Texas. The mean daily discharge the stream-gaging station Green Creek near lexander was 12.7 cfs compared with the 11-year 958-69) average of 6.14 cfs. Three storm periods ere selected for detailed analysis and computa-n. These computations include detailed time eakdown of rainfall and discharge, hydrographs, d mass curves. The storms selected occurred on pril 12, 1969, May 6-7, 1969, and July 27, 1969. summary of rainfall-runoff data for these storms tabulated. Computations along the hydrographs d mass curves for the storms are shown in the mpilation and analysis of data. (Woodard-SGS)
71-08918

ELECTED GROUNDWATER DATA IN THE UGENE-SPRINGFIELD AREA, SOUTHERN ILLAMETTE VALLEY, OREGON,
eological Survey, Portland, Oreg.
F. Frank, and Nyra A. Johnson.
regon State Engineer Groundwater Report No , Oct 1970. 70 p, 5 fig, 1 plate, 4 tab, 8 ref.

escriptors: *Hydrologic data, *Oregon, Hydrogeology, *Aquifers, *Water resources velopment, Groundwater, Data collections, ater wells, Aquifer characteristics, Water yield, ater quality.
entifiers: *Eugene (Oreg), *Springfield (Oreg).

he cities of Eugene and Springfield, Oregon, and eir outlying districts consistute an area where, cause of a rapidly growing population, progres-ely greater volumes of groundwater are being quired for industrial, irrigation, and public sup-es. Because of different geologic and hydrologic nditions in the area, the occurrence, quality, and ailability of groundwater vary considerably from ace to place. The most productive groundwater servoirs in the Eugene-Springfield area are re-ted to the alluvial deposits (sand and gravel) of e McKenzie and Willamette Rivers; con-quently, the high-yield wells are on or adjacent to e valley plain that is underlain by the alluvial posits. The water table in the alluvial aquifers is nerally only a few feet below land surface. Pump-g lifts are relatively small, and large-diameter ells produce moderate to large quantities of oundwater of good chemical quality. (Knapp-SGS)
71-08921

ATALOG OF INFORMATION ON WATER ATA, EDITION 1970 - INDEX TO AREAL IN-ESTIGATIONS AND MISCELLANEOUS ATER DATA ACTIVITIES.
eological Survey, Washington, D. C. Office of ater Data Coordination.

vailable on application to the U.S. Geological rvey, Washington, D.C. 20242. Geological Sur-y Water Data Catalog, 1971. 178 p, 2 exhibits, 2 b.

escriptors: *Data storage and retrieval, Hydrologic data, *Data collections, *Reviews, Publications, Unites States, Documentation, eal, Surface waters, Groundwater, Water sources, Federal government, State governments, vestigations.
Identifiers: *Index, *Areal investigations, Hydrologic data aquisition, Canada.

This index, for use in retrieving water data for the U. S. contains (1) the title of each investigation, (2) the geographic area covered, (3) the inclusive dates of the investigation, (4) description of the investigation, (5) whether or not a report will be published, and (6) the reporting agency. This index, which reflects activities as of January 1, 1970, is the second edition of this section of the Catalog. The first edition was the 1968 edition. The Catalog is a file of information about water-data-acquisition activities. This file is on media suitable for data processing, supplemented by microforms and station-location maps. The information contained in the Catalog file is reported on OWDC on standard forms by Federal State, municipal agencies, and private organization that acquire water data directly in the field and laboratory. Thus, the Catalog is a file of information about water-data-acquisition activities and does not contain the actual data, which must be obtained from the reporting agencies. (Woodard-USGS)
W71-08922

RECONNAISSANCE OF THE BLACK RIVER, A COLD-WATER RIVER IN THE NORTH-CENTRAL PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Washington, D.C.
G. E. Hendrickson, and C. J. Doonan.
For sale by the U.S. Geological Survey, Washington, D.C.--Price $1.25 per set. Geological Survey Hydrological Investigations Atlas HA-345, 1971. 2 sheets, Text, 3 fig, 5 map, 7 tab, 11 ref.

Descriptors: *Rivers, *Michigan, *Fishing, *Recreation, Water quality, Streamflow, Velocity, Wild rivers, Scenery, Water resources development, Maps, Hydrologic data.
Identifiers: *Black River (Mich).

The Black River north of Johannesburg in Otsego County has been rated by many fisherman as the number one brook-trout stream in the north-central part of the southern peninsula of Michigan. Headwaters are a few miles north of Johannesburg, and the Black River flows northward to join the Cheboygan River a few miles south of Cheboygan. The recreational value of a river depends on the characteristics of streamflow, water-quality, and its bed and banks. The purpose of this atlas is to describe these characteristics and to show how they relate to recreational uses. Sheet 1 of this atlas presents information on streamflow characteristics and water quality. Sheet 2 describes the physical character of the stream channel, bed and banks, and shows how it relates to streamflow, water quality, and recreational use. (Knapp-USGS)
W71-08925

RECONNAISSANCE OF THE STURGEON RIVER, A COLD-WATER RIVER IN THE NORTH-CENTRAL PART OF MICHIGAN'S SOUTHERN PENINSULA,
Geological Survey, Washington, D.C.
G. E. Handrickson, and C. J. Doonan.
For sale by U.S. Geological Survey, Washington, D.C. - Price $1.25 per set. Geological Survey Hydrologic Investigations Atlas HA-353, 1971. 2 sheets, Text, 11 fig, 5 map, 5 tab, 14 ref.

Descriptors: *Rivers, *Michigan, *Fishing, *Recreation, Water quality, Streamflow, Velocity, Wild rivers, Scenery, Water resources development, Maps, Hydrologic data.
Identifiers: *Sturgeon River (Mich).

The Sturgeon River, one of the best brown trout streams in Michigan, is located in the north-central part of the southern peninsula of Michigan with headwaters just north of Gaylord. The purpose of this 2-sheet hydrologic atlas is to describe these characteristics and to show how they relate to recreational uses. Sheet 1 of this atlas presents information on streamflow characteristics and water quality. Sheet 2 describes the physical characteristics of the stream channel and bed and banks, and shows how these physical characteristics relate to streamflow, water quality, and recreational use. (Knapp-USGS)
W71-08926

HYDROLOGIC DATA: 1968, VOLUME 4, SAN JOAQUIN VALLEY.
California State Dept. of Water Resources, Sacramento.

Copies of report available from Office of Procurement, Documents Section, P. O. Box 20191, Sacramento, Calif. 95820-Price $4.00. California Department of Water Resources Bulletin No 130-68, October 1969. 222 p, 7 fig, 4 plate, 26 tab, 5 append.

Descriptors: *Hydrologic data, *Surface waters, *Groundwater, *California, Water resources development, Data collections, Water levels, Streamflow, Water quality, Monitoring, Water wells, Aquifers, Stream gages, Climatology.
Identifiers: *San Joaquin Valley (Calif).

Report contains tables showing data on climate, surface water flow, groundwater levels, and surface and groundwater quality in the San Joaquin Valley for the 1967-68 water year. Figures show location of climatological, surface water, and surface water quality measurement stations; fluctuation of water levels in selected wells and areas; and electrical conductance at selected stations. Plates show lines of equal elevation of water in wells, spring 1968; profile of groundwater levels; cooperative study areas; groundwater level changes; and well locations. (Knapp-USGS)
W71-08927

NATIONAL REFERENCE LIST OF WATER QUALITY STATIONS-WATER YEAR 1971.
Geological Survey, Washington, D. C. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-08937

SURFACE WATER SYSTEM - OPERATIONAL HANDBOOK,
Wyoming Univ, Laramie.
William N. Embree.
Wyoming Water Resources Research Institute Water Resources Series No. 18, July, 1970, 84p.

Descriptors: *Computer programs, Data storage and retrieval, *Hydrologic data, Streamflow, *Data collections, Data processing.

The Surface Water System, developed by Wyoming Water Resources Research Institute, provides for easy and effective streamflow data processing. Daily streamflow data are stored on magnetic tape, and are processed and maintained through a separate program tape and card-oriented instructions. Complete description of all processing and maintenance instructions, as well as detailed examples of their use, are given.
W71-08941

08. ENGINEERING WORKS

8A. Structures

THE WELL DRILLER AND THE GROUNDWATER HYDROLOGIST, COMPETITORS OR ALLIES,
R. C. Smith.
Water Well Journal, Vol 13, No 7. 3 p.

Descriptors: *Water wells, Drilling, Drilling equipment, Groundwater, Water supply, Wells.

Building and maintaining a complete underground water supply without a complete hydrological sur-

vey can be like building a complete water system without a consulting engineer or a large building without an architect. In this day of growing water demands, of increasing conflicts between users of individual demands for quantities that were almost unknown not too many years ago, groundwater is an extremely valuable resource. We must use, develop and manage our vast groundwater supplies to the fullest extent and in the most efficient manner. This is the aim of the water well contractor. It is also the aim of the groundwater hydrologist. This paper attempts to bridge the 'trust gap.' (Campbell-NWWA)
W71-08408

METHODS OF SETTING AND PULLING JOHNSON WELL SCREENS.
Universal Oil Products Co., St. Paul, Minn. Johnson Div.

UOP Johnson Division Bulletin No 933 (Revised Feb 1957). 16 p, 20 fig, 2 tab.

Descriptors: *Water wells, *Screens, Rotary drilling, Drilling equipment, Acid, *Well screens, Sands.
Identifiers: Cable tool drilling.

Where conditions permit its use, the simplest and best method of setting screens is called the 'standard' or pull-back method. The only requirement for this method of installation is that the casing must be of such kind and in such condition that it can be sunk down to the point where the bottom of the screen is to be set and then pulled back the length of the screen. When a screen cannot be set by the 'standard' method and the necessity arises for setting it by bailing or washing it down with open bottom, there are several other methods which may be employed, all of which center around the 'bail-down' method. The principles upon which all bailing-down processes are based is that by maintaining a constant weight on the screen and removing the sand and gravel which lies directly below the bottom of the screen, the screen will settle down by force of gravity to take the place of the material which is withdrawn. The two essentials are, therefore, provision of proper weight upon the screen, and a means whereby the material beneath the screen may either be removed or displaced so that the screen can settle down through the water-bearing formation. The various problems encountered during installation are discussed in some detail. (Campbell-NWWA)
W71-08468

GRAVEL PACKING CONTROLS UNCONSOLIDATED SAND IN VENEZUELA FIELD,
Creole Petroleum Corp., Lagunillas (Venezuela).
P. S. McReynolds.
Journal Petroleum Technology, Vol 10, No 12, p 21-24 Dec, 1958. 2 fig, 5 ref.

Descriptors: Oil industry, *Gravel, Screens, Sands, *Well casings, Casings, *Oil wells.
Identifiers: Gravel packing, Unconsolidated sand, Venezuela, Completion methods, *Sand control, *Venezuela.

Sand control has been the major problem encountered in producing oil from the unconsolitated Miocene sands in the Lagunillas area of Venezuela. One of the first completions developed to prevent excessive sand production was the combination oil string in which pre-perforated casing was employed. In most cases this method was unsuccessful in controlling sand and was replaced in 1951 by a special slotted liner completion. The slotted liner technique has been effected in controlling sand and in obtaining high volume producers in the Bachaquero sand member. However, as a satisfactory completion depends upon the ability to wash the well into production outside the liner, this technique will soon become obsolete because of the declining reservoir pressure in the Bachaquero field. A program to evaluate gravel packing as a replacement for the slotted liner technique and to provide a sand control method for use inside existing pre-perforated completions was initiated in April, 1956. Forty-three wells have been gravel packed in the Lagunillas Dist. through Sept. 25, 1957, with two jobs considered as failures. Eight wells are awaiting installation of production equipment and are expected to be satisfactory producers when opened to production. Various problems concerning fluids, liner slot sizes and loss of gravel to the formation have been encountered. Solutions to these problems have been found and procedures for both open-hole and inside gravel packs have been developed that can be applied with confidence to the sand control problems that exist in the Bolivar coastal fields. (Campbell-NWWA)
W71-08501

SAFE WAY TO CLEAR PLUGGED BITS,
Companhia de Petroleos de Angola.
F. A. M. DaSilva.
World Oil, Vol 161, No 2, p 114 and 118, Aug 1965.

Descriptors: *Drilling, *Oil industry, Drilling equipment, Drilling fluid, *Mud, Mud-water interfaces.
Identifiers: Mud densities, Annular mud velocity, Reverse mud circulation, Plugged bit.

Plugged bits are common problems in the drilling industry. Bits usually are plugged inside by cuttings, mud cake or sand. This can be caused by differences in mud densities (higher in annulus than in the drill pipe) when a connection is made. Mud flows back into the drill string and some cuttings, mud cake or sand enter through bit nozzles. After the connection is made, the pump is started, causing an abrupt increase of pressure which compacts the cuttings in the bit. Many times, it is impossible to resume circulation. A safe solution to the problem lies in progressively increasing the pressure differential at the bit. (Campbell-NWWA)
W71-08505

SPILLWAY FOR BELLEVILLE LOCKS AND DAM, OHIO RIVER, OHIO AND WEST VIRGINIA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. A. Pickering.
Available from the National Technical Information Service as AD-719 170, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-687, Aug 1965. 10 p.

Descriptors: *Dams, *Model studies, *Flow, *Test procedures, Spillways, Stilling basins, Riprap.
Identifiers: Belleville Dam.

The spillway at Belleville Dam will consist of eight 110-ft-wide bays through which flow will be regulated by tainter gates. Energy dissipation will be accomplished on a horizontal apron with baffle piers and an end sill. Model investigations were conducted on a 1:36-scale section model which reproduced one central gate bay and approximately half of each adjacent gate bay. Tests were concerned with gate sill shape, stilling basin performance, and riprap requirements downstream from the stilling basin. Tests revealed that flow conditions were satisfactory for all partial gate openings with the original design gate sill shape. The original design stilling basin resulted in high bottom velocities in the exit channel which were reduced by lowering the elevation of the basin apron. The stability of a stone protection blanket placed on a 1-on-6 slope downstream from the end sill was determined.
W71-08512

BREAKER TRAVEL AND CHOICE OF DESIGN WAVE HEIGHT,
Army Coastal Engineering Research Center, Washington, D.C.
For primary bibliographic entry see Field 08B.
W71-08528

AUBURN DAM WILL BE THE WORLD'S LONGEST CONCRETE ARCH DAM,
Bureau of Reclamation, Denver, Colo.
B. P. Bellport.
World Dams Today, p 343-347, 1970. 5 p, 6 fig.

Descriptors: Dams, *Concrete dams, *Arch dams, Thin arch dams, Bridges (Structures), Large structure, *Double-curvature arch dams, Dam design, Dam foundations, Foundation investigations, Hydroelectric powerplants, Geologic investigations, Spillways, Environmental effects, Outlet works.
Identifiers: *Auburn Dam (Calif), Superlative, Central Valley Project, Bureau of Reclamation.

Auburn Dam will be the principal structure of the Bureau of Reclamation's Auburn-Folsom South Unit of the Central Valley Project in California. The dam will be a double-curvature, thin-arch structure, 4,000 ft long, 685 ft high, and will have a volume of 6,000,000 cu yd of concrete, a crest width of 40 ft, and a maximum base width of 200 ft. Major features of the dam, including the power plant, outlet works, spillways, elevated highway crossing on the crest of the dam, and a bridge that will cross an arm of the reservoir, are described. A feature new to Bureau of Reclamation design is a pad of concrete to be placed as an integral part of the dam throughout the profile of the damsite between the arch and abutment rock. The pad will improve the symmetry of the arches and reduce the load intensity between the arch section and abutments by distributing the pressure more uniformly on the foundation. Extensive foundation investigations and tests were made because of the size of the dam and the complexity of the geological formation at the damsite. (USBR)
W71-08622

STABILITY OF COLUMNS WITH TRANSIENT LOADS,
Illinois Univ., Urbana.
S. M. Holzer.
Proceedings, American Society of Civil Engineers, Journal of Engineering Mechanics Division, Vol 96, No EM6, p 913-930, Dec, 1970. 18 p, 4 fig, 3 tab, 9 ref, 3 append.

Descriptors: *Stability analysis, *Columns, Transient stress, *Dynamic loads, Amplification, Dynamic stability, *Structural analysis, Dynamic response, Structural stability, Loads (Forces), Structural engineering, Structural members, Differential equations, Displacements, Deflection, Motion, Analytical techniques.
Identifiers: Equations of motion, Perturbation, *Liapunov theorem.

The transverse motion of elastic columns with general end fixity subject to transient loading is described by an integro-differential equation reduced to a set of ordinary differential equations. Liapunov's direct method of the general problem of stability of motion is employed to ascertain stability directly from the differential equations of motion without knowledge of the solution. For the special case of simply supported columns, a Liapunov function is constructed, and a stability criterion is deduced from the characteristics of the function. The stability criterion constitutes a relation between a bound on the amplification of the initial perturbation and the corresponding force pulse. The relation is obtained in explicit form. Application of the stability criterion is shown for 3 sample loadings: a trigonometric pulse, a parabolic pulse, and a step pulse. The amplification bound is evaluated through comparison with the trajectory of maximum response of the governing differential equations of motion. Use of the criterion is a simple and quick method for the stability analysis of simply supported columns.
W71-08644

WATER WELL ENGINEERING, MORE WELL DESIGN CRITERIA,
Bureau of Reclamation, Denver, Colo.
T. P. Ahrens.

ater Well Journal, Vol 12, No 11 and 12, Nov d Dec 1958. 8 p, 7 fig.

escriptors: *Water wells, *Drilling, Rotary lling, Drilling equipment, Drilling fluids, reens, Cement, Casings.
ntifiers: *Artesian aquifer, *Unconfined uifer, *Well design criteria, Sample descriptions, ell development, Pump tests, Specific yield.

thematically sound and physically correct oretical equations have been developed which sumably may be used to analyze nearly any mbination of aquifer characteristics and well sign. However, all of the equations assume a owledge of and a uniformity of conditions and an curacy of measurement which are virtually im- ssible to realize. Indeterminate errors are con- uently inevitable. Investigations or tests to minate the errors are neither physically nor nomically feasible. Nevertheless, the formulas l equations are basic to good well design. Of al importance is judgment based on experience ich permits an estimate of the influence of the letermined errors. Because of our dependence judgment, there is probably a tendency to over- ign on important well installations. It is doubtful his can ever be fully overcome, but it can be uced, and limited by further research and the hange of ideas and developments. (Campbell- WA)
1-08666

MENTING SMALL WELLS,
ler (J. P.) Artesian Well Co., Brookfield, Ill.
A. McEllhiney.
ter Well Journal, Vol 9, Nos 1 and 2, Jan and 1955. 5 p, 10 fig.

escriptors: *Water wells, *Drilling, *Cement, lling equipment.
ntifiers: *Cementing, Cementing pipe string, ssure - grouted liner, Portland cement, Cement- shoe.

s paper treats water well cementing techniques ractical detail. The author is well known in the d for his outstanding knowledge and experience water well construction techniques. It is well il- rated and has considerable emphasis on the itary aspects of well construction. (Campbell- WA)
1-08667

W TO COMPLETE WATER SOURCE LLS,
rathon Oil Co., Regina (Saskatchewan).
D. Todd.
rld Oil, Vol 164, No 4, p 86-91, Mar 1967. 2 fig, ref.

escriptors: *Water wells, *Oil industry, Gravels, lling.
ntifiers: *Gravel packing, Selection of gravel terial, Saskatchewan, Deep well difficulties.

efully planned and executed completion cedures developed especially for water source ls have provided an adequate, reliable and nomical supply of water for three major adian fluid injection projects. Modified and plified gravel packing techniques are primarily onsible for sand-free water production at rates ,000 bpd per well. Although developed for use pecific types of wells in one area, it is felt that ny of the methods that have proved successful be applied to water source wells anywhere. s article discusses the experience-derived gravel king techniques and other related completion ctices perfected by Marathon Oil Co. for its er source wells in Southwestern Saskatchewan. mpbell-NWWA)
1-08830

E ROLE OF THE DRILLING CONTRACTOR ERSEAS AS SEEN BY THE OPERATOR,
oco International Oil Co., Chicago, Ill.

For primary bibliographic entry see Field 06A.
W71-08841

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN NEW YORK.
Corps of Engineers, New York. North Atlantic Div.
For primary bibliographic entry see Field 04A.
W71-08902

WELL DESIGN CRITERIA,
Bureau of Reclamation, Denver, Colo.
T. P. Ahrens.
Water Well Journal, Vol. 11, Nos. 9 and 11, 8 p., September and November, 1957, 4 fig., 1 ref.

Descriptors: *Water wells, *Drilling, Rotary drilling, Drilling equipment, Drilling fluids, Screens, Cement, Casing.
Identifiers: *Well design criteria, Sample analyses, Selection and design of packs, Pack materials, Screen slot size, Well development.

This paper outlines some of the procedures and well design criteria developed or adopted and used by the Office of Drainage and Ground water Engineering of the Bureau of Reclamation in Denver. It deals principally with irrigation wells, but much of the criteria are applicable to domestic, industrial, and municipal water wells. The criteria generally do not apply to wells for ground water observations, ground water recharge, drainage, excavation de-watering, drilling water supply or for other temporary or special purposes. The Bureau drills wells in the 17 Western states and in some of the territories. Available drilling equipment and materials, well construction methods, and local physical conditions vary widely over this large area. The aim of well design is always the best possible well for the purpose, taking into consideration the demand, required period of sustained pumping, effective life, initial investment, operation and maintenance costs, local regulations and practices, and normal precautions on sanitary construction and aquifer contamination. Accordingly, the objective is to design the most efficient and economical well for any given aquifer and purpose. (Campbell-NWWA)
W71-08931

8B. Hydraulics

TRANSPORT AND DISPERSION OF FLUORESCENT TRACER PARTICLES FOR THE FLAT-BED CONDITION, RIO GRANDE CONVEYANCE CHANNEL, NEAR BERNARDO, NEW MEXICO,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02J.
W71-08328

CALCULATION OF FLOWS DURING SUDDEN FLOW EXPANSION (RUSSIAN: RASCHET TECHENIY PRI VNEZAPNOM RASSHIRENII POTOKA),
Leningradskii Institut Inzhenerov Vodnogo Transporta Moscow (USSR).
A. N. Butakov.
Meteorologiya i Gidrologiya, No 11, p 70-76, Nov 1970. 3 fig, 6 ref.

Descriptors: *Flow measurement, *Model studies, *Non-uniform flow, *Channel flow, Foreign research, Turbulent flow, Reynolds number, Viscosity, Roughness (Hydraulic), Friction, Eddies, Froude number.
Identifiers: *USSR, Reflux.

An attempt is made to calculate the velocity field during sudden nonuniform expansion of flow, taking into account tangential stresses of turbulent visosity and bottom friction. A model of a sharply expanding reach consisting of an inlet channel 5 m long and 0.5 m wide and terminating in a symmetrical, sharply expanding reach 7 m long and 3 m wide is used. Depth of flow is 5.5 cm and the Reynolds and Froude numbers are 10,000 and 0.08, respectively. Kinematics of flow is studied for two bottom roughnesses: a smooth bottom and a bottom with a roughness in the form of 5-mm high staggered projections 1.5-2 cm apart. A comparison of experimental and theoretical data is made for coefficients of turbulent flow 0.04, 0.05, 0.06 and 0.08, and for a change in the friction coefficient ranging from 0.002 to 0.020. A good fit of design velocity curves with experimental curves is obtained for coefficient 0.04, irrespective of roughness, provided friction coefficients 0.0025 and 0.011 are assumed for the first and second series of experiments, respectively. Calculations performed for a suddenly expanding reach of limited width with friction coefficients 0.0000, 0.0010 and 0.0016 reveal that bottom roughness has a great effect on the length of an eddy zone and the reverse flow (reflux) rate. (Josefson-USGS)
W71-08371

TRANSPORT PROCESSES OF PARTICLES IN DILUTE SUSPENSIONS IN TURBULENT WATER FLOW - PHASE I,
Illinois Univ., Urbana. Water Resources Center.
Barclay G. Jones, James A. Beoletto, Charles C. Meek, Raymond J. Ostensen, and Ronald Robin.
Available from the National Technical Information Service as PB-199 710, $3.00 in paper copy, $0.95 in microfiche. Research Report No 40, Water Resources Center, University of Illinois, Urbana, Illinois, Mar, 1971, 36 p, 14 fig, 20 ref. OWRR Project A-019-ILL (2).

Descriptors: *Water pollution sources, Flow measurements, *Dispersion, *Turbulent flow, Flow.
Identifiers: *Turbulent particulate transport, Dilute suspension, Non-Stokesian.

Modifications to an existing experimental system have been made and have been demonstrated to provide the required resolution and variable parameterization necessary for a detailed study of dilute particle suspensions in a turbulent water flow. These modifications together with the reasons for their necessity are discussed. Linearization of non-Stokesian drag has been accomplished through the introduction of a diagonal tensor into the stokes drag force equation. It was found that non-Stokesian effects tend to be of minor importance in the response of water borne particles.
W71-08492

HYDRODYNAMICS AND DISCHARGE MEASUREMENTS OF STORM SEWERS,
Rutgers - The State Univ., New Brunswick, N. J. Water Resources Research Inst.
E. L. Bourodimos, and A. Oguntase.
Available from the National Technical Information Service as PB-199 712, $3.00 in paper copy, $0.95 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, Mar 1971, 13 p, 4 fig. OWRR Project A-028-N.J. (1).

Descriptors: *Storm drains, *Hydrodynamics, Storm runoff, Fluid mechanics, Flow, Hydraulics.
Identifiers: *Urban hydrology, Storm sewers.

This completion report was a first step in a study of flow in storm sewers. A critical review of a major protion of numerous theoretical and experimental research papers on gradually varied unsteady flows has been completed. The engineering relevance of these studies to storm sewer flow dynamics is evaluated for practical applications for storm runoff in urban areas. Lateral inflow dynamics (spatially varied flow) is now under consideration and study. This will conclude the first major phase of the program, i.e., the mathematical modelling and theoretical analysis. The next step will be the analytical study and modelling of diffusional processes in combination with such types of flows in storm sewers. The two other phases of the program are: i) field work and investigation, and ii) experimental laboratory study on a simplified sewer system model and comparison of theoretical pre-

dictions with field and laboratory data. (Whipple-Rutgers)
W71-08496

LOCK FILLING AND EMPTYING SYSTEM, HOLT LOCK AND DAM, WARRIER RIVER, ALABAMA: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
T. E. Murphy, and J. H. Ables.
Available from the National Technical Information Service as AD-719 680, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 2-698, Nov 1965. 127 p, 70 fig, 26 tab.
Identifiers: *Dams, *Design, Drainage, Hydraulic models, Model tests, Alabama, Inland waterways, Fluid flow, Construction, *Holt Lock and Dam, *Warrior River, *Locks, Waterways, Tuscaloosa, Alabama, Spillways.

A 1:25-scale model was used to confirm the adequacy of the proposed, floor lateral culverts, filling and emptying system. A 1:15-scale model of the reverse tainter culvert valve was used to determine loads and load variations on he valve hoisting mechanism and means of reducing these loads. The adopted filling and emptying system included 12 lateral culverts with 10 ports each, centered in the lock, alternating from the two longitudinal culverts, and covering about 28 percent of the chamber length. The lock can be filled in 11 min and emptied in 12.6 min with hawser stresses not exceeding 5 tons. A split-lateral system was also investigated. However, the interlaced system is preferable for single-culvert, or nonsynchronized valve operation. Two basic designs of the reverse tainter valve were investigated. In the adopted design the skin plate was separated from the main girders by T-beams which allowed flow circulation along the upstream face of the skin plate; in the alternate design, the main structural members were inclosed in streamlined compartments.
W71-08506

OUTLET WORKS, COCHITI DAM RIO GRANDE, NEW MEXICO. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Thomas E. Murphy, and Don R. Bucci.
Available from the National Technical Information Service as AD-719 681, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 2-705, Nov 1965. 73 p, 49 fig, 2 tab.
Identifiers: *Dams, *Design, Hydraulic models, Fluid flow, Piers, Operation, Sand, Silt, *Cochiti Dam, *Rio Grande, New Mexico, *Outlet works, Weirs, Stilling basins.

The combination energy dissipator-irrigation diversion structure was studied in a 1:20-scale hydraulic model to verify and possibly refine the design of the primary and secondary stilling basins, determine the discharge characteristics of the weir between the two basins and each of the two diversion sluices, and investigate qualitatively the performance of the silt sluices. The performance of the energy dissipator was improved by raising the apron of the secondary basin 5 ft and modifying the position of the baffle piers in the primary basin and the size and position of the baffle piers and end sill in the secondary basin. The capacity of the irrigation diversion sluices was found to be adequate. The hydraulic performance of the silt sluices was as anticipated, but at low discharges, fine sand was removed from the model only in the immediate vicinity of the sluice intakes.
W71-08507

MATAGORDA SHIP CHANNEL MODEL STUDY, MATADORDA BAY, TEXAS: HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Henry B. Simmons, and Henry J. Rhodes.
Available from the National Technical Information Service as AD-719685, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 2-711, Jan 1966. 215 p, 122 fig, 31 tab.
Identifiers: *Inland waterways, *Hydraulic models, *Bays, Navigation, Hydraulic models, Salinity, Alignment, Site selection, Design, Tides, Mexico Gulf, Texas, Matagorda Ship Channel model, Matagorda Bay, *Channel improvements, Jetties, Channels, Waterways, Stream flow.

A fixed-bed model of Matagorda Bay was constructed to scale ratios of 1:1000 horizontally and 1:100 vertically as an aid in developing a sound engineering design of the project, including selection of the optimum channel location, design of protective works for the channel, and determination of changes in the hydraulic and salinity regimens that would occur as a result of natural and man-made changes. Several modifications of the basic plan were tested including various lengths of jetties and dikes, with and without assumed accretions; various alignments and side slopes of the entrance channel; and several arrangements of spoil disposal banks. Tests were also conducted to determine the effects on the hydraulic and salinity regimens of the bay of changes in prototype conditions brought about by hurricane and flood conditions, and of future enlargements of the project as may be required by navigation interests.
W71-08508

FILLING AND EMPTYING SYSTEM CANNELTON MAIN LOCK, OHIO RIVER, AND GENERALIZED TESTS OF SIDEWALL PORT SYSTEMS FOR 110 - BY 1200-FT LOCKS HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Jackson H. Ables, and Marden B. Boyd.
Available from the National Technical Information Service as AD-719686, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 2-713, Feb 1966. 157 p, 80 fig, 34 tab, 3 ref.
Identifiers: *Dams, *Design, Fluid flow, Hydraulic models, Hydraulic systems, Shear stresses, Model tests, Pressure, Kentucky, *Cannelton Main Lock, *Ohio River, Locks, Waterways, Sidewall port systems.

The Cannelton main lock will be 110 ft wide by 1270 ft long, pintle to pintle. The hydraulic system was tested in a 1:25-scale model. Tests of 56 sidewall port arrangements resulted in the adoption of the type 45 which is composed of 25 type A ports (2.75 ft wide by 4.07 ft high at the throat) spaced 28 ft on centers in each 16- by 18-ft culvert. The original design culvert intake manifolds and culvert outlets performed satisfactorily. The adopted hydraulic system will permit the lock to be filled in about 8 min and emptied in about 9.5 min with acceptable lock chamber turbulence and hawser stresses. Following the specific tests for Cannelton main lock, generalized tests were conducted on sidewall port arrangements for 110- by1200-ft locks. Results of these tests and recommendations for sidewall port systems in locks of this size are included.
W71-08509

SELECTION OF OPTIMUM PLAN FOR IMPROVEMENTS IN NASSAU, NEW PROVIDENCES, BAHAMAS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Charles W. Brasfeild.
Available from the National Technical Information Service as AD-719238, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-696, Oct 1965. 26 p.

Descriptors: *Breakwaters, *Model studies, *Harbors, *Ocean waves, Ocean currents, Tides, Deep water.
Identifiers: *Harbor models, Bahama Islands, Ocean models, Test equipment, Nassau Harbor.

A 1:100-scale model of Nassau Harbor and suffi- cient offshore area to permit simulation of approaching waves was used to determine the optimum arrangement and design of certain proposed harbor improvements with respect to wave action and to determine current direction and velocities in the navigation channel and inner harbor area. The proposed harbor improvements consisted of (a) widening and deepening the entrance channel and turning basin; (b) constructing protective breakwaters at the channel entrance; (c) constructing a large artificial island in a shallow area inside the west breakwater; and (d) constructing a new pier in the inner harbor. The model was equipped with wave-generating and wave-measuring apparatus; a water-circulating system was also installed to allow simulation of steady-state tidal flows through the harbor area. It was concluded that navigation conditions would be satisfactory in the entrance channel and the inner harbor following installation of the proposed revisions, provided certain modifications were effected. Modifications recommended included lowering the crown elevation of each breakwater, installing wave absorbers at critical locations along the proposed structures, and relocating the artificial island. Appendix A presents an analysis of the prototype tides and currents in Nassau Harbor.
W71-08510

STABILITY OF RIPRAP AND DISCHARG CHARACTERISTICS, OVERFLOW EMBANK MENTS, ARKANSAS RIVER, ARKANSAS HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Statio Vicksburg, Miss.
N. J. Brogdon, Jr., and J. L. Grace.
Available from the National Technical Informatic Service as AD-717 873, $3.00 in paper copy, $0.9 in microfiche. WES Technical Report 2-65 Vicksburg, Miss, June 1964. 19 p, 5 tables, photos, 48 plates.

Descriptors: *Dams, *Model studies, *Emban ments, *Riprap, Shore protection, Flow, Scou Pressure, Roughness, Discharge, Arkansas.
Identifiers: Surface roughness, Arkansas River.

Hydraulic model tests were conducted on overflo embankments similar to those which will be i tegral parts of navigation dams on the Arkans River to determine the stability of various grad tions of protective stone and the discharge chara teristics of such structures. The effectiveness four gradations of riprap, with maximum sto diameters of 16, 24, and 36 in. was investigated 3- and 10-ft-high, 30- to 35-ft-wide (at crown), cess type embankments (i.e. paved roadway crown), and on 3- and 6.75-ft-high, 20- to 27.5- wide, nonaccess type embankments. The emban ment designs were furnished by the U. S. Army E gineer District, Little Rock. The tests were co ducted on a 1:4-scale section model whi reproduced 90 ft of approach channel, a 40-ft-wi section of the overflow embankment, and 140 ft exit channel. Fiber glass cloth was used to simul the gravel or crushed rock filters of the prototy In addition, a 1:12-scale section model was tes in a 1-ft-wide, glass-sided flume to determine pr sures on the crest and downstream slope of the e bankment. Observations of pressures in the zo where movement of stone was observed revea (1) instantaneous pressure fluctuations of as mu as 1.0 psi (prototype); and (2) reduced aver pressures as anticipated. Transition riprap on roadway shoulder, desirable in the interest of t fic safety, was quite easily displaced and thus considered unsatisfactory with regard to desired hydraulic performance. However, the t indicated that considerably smaller stone can used on the lower, submerged portions of downstream slope of an embankment provi such practice is warranted economically. results indicate that the combined effect of bankment height and crown width on riprap sta ty is small, that access type embankments can considered slightly more stable than nonacc types, that all stone failure occurred in the zon free flow, and that the effective or critical

ne of a particular gradation is that which presents 60 to 65 percent by weight of the total. e variation in roughness of the four gradations of ne had no liscernible effect on the discharge aracteristics of the overflow embankments thin the range of heights (3 to 10 ft) and crown dths (20 to 35 ft) investigated. The discharge aracteristics of the two types of overflow em-nkments were essentially the same. Discharge efficients applicable to the two types of embank-nts were determined for both free and sub-rged flows, and empirical equations were veloped.
71-08514

EN-CHANNEL INTEGRATING-TYPE FLOW TER,
ological Survey, Albuquerque, N. Mex.
r primary bibliographic entry see Field 07B.
71-08525

EAKER TRAVEL AND CHOICE OF DESIGN VE HEIGHT,
ny Coastal Engineering Research Center, shington, D.C.
ril J. Galvin, Jr.
CE Proceedings, Journal of the Waterways and rbors Division, Vol 95, No WW2, Paper 6569, p 5-200, May 1969. 26 p, 16 fig, 4 tab, 26 ref, ap-nd.

scriptors: *Ocean waves, *Beaches, *Break-ters, *Coastal engineering, *Shore protection, draulic structures, Model studies, Testing, Test cedures, Harbors, Engineering structures, Wave -up, Black Beach erosion.
ntifiers: *Wave forecasting, Wave runup.

periments on three-plane laboratory beaches w that plunging waves travel a horizontal tance of from four to eight times breaker height ing the breaking process. This suggests that the entially damaging effect of breaking waves may spread over a significant horizontal distance. e experiments, as well as previously available a, show that breaker depth-to-height ratios for nging waves decreases from above 1.3 to below as beach slope increases, so that higher waves steeper slopes may approach nearer to shore be-e breaking. The combined effect of breaker vel and breaker travel and breaker depth-to-ght ratio is such that structures sited in shallow er on moderate or steep slopes can be subject to aking wave heights significantly larger than the ign heights computed according to accepted ctice. The experimental results are consistent h a solitary wave description of oscillatory ves at breaking, if the breaker depths of oscilla-y waves are appropriately defined, and they are sistent with the limiting heights of breaking ves measured on rubble-mound breakwaters. oodard-USGS)
1-08528

STEADY FREE-SURFACE FLOW COMPU-TIONS,
chigan Univ., Ann Arbor.
3. Wylie.
ceedings, American Society of Civil Engineers, rnal of the Hydraulics Division, Vol 96, No 11, p 2241-2251.

scriptors: Canals, Computer applications, draulics, Free surfaces, *Open channel flow, drology, Overland flow, *Unsteady flow, Equa-ns, Numerical analysis, Flow, Channel flow, thodology, Finite differences, River flow, Com-ation, Formulation, Momentum equation, Sub-ical flow, Continuity equation, Comparative dies, Fluid mechanics.
ntifiers: *Method of characteristics.

utions of the free-surface equations for subcriti-unsteady, one-dimensional flow by explicit and plicit formulations of the characteristics grid and tangular grid methods are analyzed. All 4 for-mulations are based on the method of characteristics. Advantages and disadvantages of each procedure are given. Examples emphasize the important features and corroborate a stability criterion that is presented. The implicit characteristics grid approach is the most accurate for overland flow situations or analysis of single channels, but is not useful for complex systems. The explicit rectangular grid is the simplest to program, but may lead to instabilities when very large time increments are used. The latter method is also comparatively expensive for long-duration transients. (USBR)
W71-08633

RESULTS OF FIELD INVESTIGATIONS OF VELOCITIES OF WATER MOVEMENT IN COOLING RESERVOIRS,
B. N. Gorobets.
Gidravl Gidrotekh Mezhvedom Respub Nauch-Tekh Sb, Kiev, No 3, p 132-138, 1966. Transl from Russ, Bur Reclam Transl 844, Jan 1971. 13 p, 6 fig, 8 ref.

Descriptors: Field investigations, *Thermal powerplants, Salt velocity method, Ponds, *Cooling, *Density stratification, Instrumentation, Water circulation, Turbulent flow, *Velocity distribution, Wind (Meteorology), Hydrodynamics, Model tests, Foreign research, Stratified flow, Cooling systems, Reservoirs.
Identifiers: USSR, Richardson number, Vertical temperature gradient, Temperature distribution.

Pond cooling of discharges from thermal powerplants is often used to avoid thermal pollution of streams. Knowledge of the hydrodynamics of cooling ponds and reservoirs is necessary for stable and reliable plant operation. Research to determine velocity distributions in a prototype cooling reservoir with an area of 2.5 sq km, a volume of 16 million cu m, and a depth ranging from less than 6.5 to a maximum of 17.5 m is described. Special instrumentation was developed for measuring the magnitude and direction of the reservoir currents. A complex pattern was observed, including spiral motion. Comparisons are made with velocity patterns measured in 1:50 and 1:250 scale models. The velocity pattern is caused by: (1) centrifugal inertial forces introduced by bending of the throughflow jet, (2) temperature stratification, and (3) wind action. (USBR)
W71-08641

BED ROUGHNESS OF A LARGE RIVER IN AN ALLUVIAL CHANNEL,
Mississippi State Univ., State College. Dept. of Civil Engineering.
Victor L. Zitta, and Melville S. Priest.
Available from the National Technical Information Service as PB-199 913, $3.00 in paper copy, $0.95 in microfiche. Mississippi Water Resources Research Institute, State College, May 1971. 15 p, 8 fig, 2 tab. OWRR Project A-049-MISS (1).

Descriptors: Rivers, River beds, *Channel flow, Boundary layers, *Open channel flow, *Roughness (Hydraulic), Mississippi River.

Data from several reaches of the lower Mississippi River, for a considerable range of discharge, are analyzed for the purpose of establishing a better understanding of the height of bed roughness and its variations along and across the stream. Data relating to the height of bed roughness in the channel, at crossings and at bends, yield to a quantitative solution. In this context, the channel is generally 'the deeper part' of the stream. Data relating to lateral variations in height of bed roughness are discussed in a qualitative manner.
W71-08662

USE OF RADIOISOTOPES IN TRACING RESERVOIR LEAKAGE AT ANCHOR DAM,
Bureau of Reclamation, Denver, Colo. Chemical Engineering Branch.
Robert L. Hansen, and Gerald A. Teter.
Available from the National Technical Information Service as TID25396, $3.00 in paper copy, $0.95 in microfiche. Report TID25396, July 1970. 28 p, 11 fig, 4 tab, 6 ref.

Descriptors: *Groundwater flow, Deep wells, Observation wells, Perched water table, Counters, Detectors, Injectors, Water sampling, Temperature sensors, Laboratory equipment, Gamma rays, Beta rays, Flow rates, Field tests, *Seepage losses, Tracers, *Radioisotopes, *Reservoir leakage, Tritium, Flow measurement.
Identifiers: *Anchor Dam (Wyo), Atomic Energy Commission, *Radioactive tracers, Mobile laboratories, Cavernous rock.

Radioisotope techniques and equipment were developed to trace the movement of leakage from Anchor Reservoir near Thermopolis, Wyo. Field tests were performed in the summers of 1965, 1966, and 1967. Iodine-131 as NaI was applied in the measurement of ground-water velocity using the single drill hole method. Velocity measurements were made when the reservoir was dry, and results were compared to those obtained when water was impounded behind the dam. Tritiated water was added to the reservoir leakage, and water samples were obtained from drill holes located near the reservoir for analysis of tritium content. Reservoir leakage is through a system of underground caverns which have opened to the surface predominantly at a few discrete areas on the north and northeast sides of the reservoir. Ground-water dissolved oxygen content, tritium tracer experiments, and ground-water level showed that the water cascades into a cavernous system and is carried from the reservoir area in a major escape route, with a relatively small amount being added indirectly to the normal ground-water system. Contribution to the ground-water system causes a temporary water table buildup beneath the reservoir.
W71-08863

FLOW IN CHUTE SPILLWAY AT FORT RANDALL DAM; HYDRAULIC PROTOTYPE TESTS,
Corps of Engineers, Vicksburg, Miss.
Carl J. Huval.
Available from the National Technical Information Service as AD-719 687, $3.00 in paper copy, $0.95 in microfiche. WES Technical report no 2-716, Apr 1966. 31 p.

Descriptors: *Dams, *Model studies, *Spillways, *Flow.
Identifiers: Fort Randall Dam.

Tests were conducted in the summers of 1960 and 1962 on the chute spillway of Fort Randall Dam to investigate the characteristics of the supercritical flow and provide data for use in future design work. Measurements were made at mean flow depths from 1.5 to 3.4 ft with average velocities from about 27 to 47 fps. This gave Reynolds numbers from about 1.3 x 10,000,000 to 6.4 x 10,000,000 and Froude numbers from 3.9 to 4.5. Two specially built pitot piers were installed in the spillway chute to measure vertical distributions. Depths of flows along the chute were measured with weighted wire gages. Water-surface depths measured on the chute spillway appeared to be close to the normal depths at the downstream end of the chute. Vertical velocity distributions on the spillway slab were in good agreement with a logarithmic equation for the supercritical flow conditions of the tests. Flow resistance was relatively high, possibly due to the concrete spillway slab joints or water-surface wave effects in the supercritical flow. Equivalent sand grain roughness values and the slope of the velocity distribution curve agree with results of previous investigations. Similar tests at other projects would be of great value, especially if data were obtained in locations on the spillways where nonuniform flow conditions occur.
W71-08865

EDDY FORMATION BEHIND CIRCULAR CYLINDERS,
California Univ., Berkeley. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02E.
W71-08910

REAERATION IN OPEN-CHANNEL FLOW,
Geological Survey, Fort Collins, Colo.
J. P. Bennett, and R. E. Rathbun.
Geological Survey Open-file Report, April 1971. 314 p, 17 fig, 16 tab, 158 ref, 2 append.

Descriptors: *Reaeration, *Dissolved oxygen, *Oxygen sag, *Open channel flow, *Tracers, Reoxygenation, Reviews, Publications, Bibliographies, Photosynthetic oxygen, Biochemical oxygen demand, Air-water interfaces, Path of pollutants, Mixing, Turbulence, Self-purification, Water pollution, Water quality control.
Identifiers: Open-channel reaeration.

Reaeration, the physical absorption of oxygen from the atmosphere, is the primary process by which a stream replaces oxygen consumed in the biodegradation of organic wastes. This report consists of a review of the literature on methods for measuring and predicting the reaeration coefficient in open-channel flows. The tracer procedure is superior to the dissolved oxygen and disturbed equilibrium techniques for measuring the reaeration coefficient but requires the use of radioactive tracers. Theoretical models of the oxygen absorption process are not suitable for prediction of the reaeration coefficient in streams because the model parameters have not been adequately related to the bulk-flow hydraulic variables. Semi-empirical and empirical equations developed from experimental data adequately predict reaeration coefficients for streams of the type of which the equations were based but large errors may occur when the equations are applied to tother types of streams or to conditions outside the variable range considered in the original correlation. Analysis of available data indicates that there is a significant difference between reaeration coefficient regression equations based on flume data and equations based on natural stream data. (Knapp-USGS)
W71-08936

8C. Hydraulic Machinery

MARINE FOULING IN POWER STATIONS,
Central Electricity Generating Board, Southampton (England). Marine Biological Lab.
For primary bibliographic entry see Field 05D.
W71-08598

A CRITIQUE OF MHD POWER GENERATION,
Avco-Everett Research Lab., Everett, Mass; and Argonne National Lab., Ill.
W. D. Jackson, M. Petrick, and J. E. Klepeis.
Transactions American Society of Mechanical Engineers, Ser A--J Eng Power, Vol 92, No 3, p 217-230, July 1970. 14 p, 22 fig, 55 ref.

Descriptors: *Magnetohydrodynamics, *Electric power production, Plasma physics, *Energy conversion, Research and development, Technology, Pilot plants, Electric generators, Economics, Environmental effects, Magnetic fields, Efficiencies, Bibliographies, Electric power, Base loads, Peak loads (Electric), Electric power demand.

Magnetohydrodynamic (MHD) electrical power generation is a technique for upgrading the efficiency of converting heat into electricity. Use of the technique in base-load plants, in addition to increasing overall efficiency, can lead to important reductions in the adverse environmental effects of thermal and air pollution. The projected efficiencies of large dual-cycle systems are initially in the range of 47-50%, and improvements in technology could increase the range to 60%. In an MHD system, energy is extracted from a flowing electrically conducting fluid of either a seeded plasma or a liquid metal. Various MHD power cycles and systems are under consideration. The status of these systems is reviewed, with emphasis on application to large central-station commercial systems. The major technological problems and progress in the 3 major cycles (open cycle, closed-cycle plasma, and closed-cycle liquid metal) are discussed. In the open-cycle system, solutions proposed for the major problems are detailed and experience is summarized. In the closed-cycle plasma system, progress made toward developing a generator with the requisite conversion efficiency is cited. Techniques leading to improved efficiencies are detailed. (USBR)
W71-08625

NOISE MEASURING AS A COMPLIMENTARY AND CHECKING METHOD FOR PUMP TESTING,
Budapest Technical University (Hungary).
J. J. Varga, and G. Sebestyen.
International Association of Hydraulics Research, Symp 1970. Stockholm, Sweden, 1970. 12 p, 15 fig, 8 ref.

Descriptors: *Sound, Acoustics, *Detection, Noise (Sound), Vibration, *Pumps, Test results, *Cavitation noise, Hydraulic machinery, Impellers, *Pump test, Foreign research, Research and development, Foreign tests, Reliability, Experimental data, Frequency, Accuracy, Efficiencies.
Identifiers: Hungary.

Experimental research work in correlating noise level and vibration with cavitation erosion in hydraulic pumps is reviewed. Results of the noise level measurement method developed for acoustic detection of cavitation phenomena show that the method can be very helpful in determining an opinion of the cavitational behavior of hydraulic machines. Without visual observation, the method yields more information than the hydraulic characteristics by making noise level measurements on a single properly chosen frequency. Noise level curves belonging to the characteristic curves of the pump and to the suction capacity curves determine cavitation conditions of the pump over the full delivery range. Noise level measurements increase the reliability of hydraulic measurements and give designers a basis for estimating cavitation behavior of the impeller and pump. (USBR)
W71-08631

ELECTRICAL DESIGN CONSIDERATIONS OF THE NELSON RIVER HVD TRANSMISSION LINE,
Teshmont Consultants, Ltd., Winnipeg (Manitoba).
M. W. Stoddart, and J. F. Graham.
Engineering Journal of Canada, Vol 53, No 10, p 44-50, Oct 1970. 7 p, 9 fig, 2 tab.

Descriptors: *Electrical design, *Transmission lines, *Direct current, Transmission (Electrical), Electric conductors, Electric coronas, *Extra high voltage, Overhead ground wire, Foreign construction, Guyed towers, Radio interference, Evaluation, Economics, Flashover, Lightning, Safety, Electrical insulators, Clearances, Bundled conductors, Overloads.
Identifiers: Canada, Transmission line hardware, Nelson River (Canada).

The Nelson River HVDC Transmission System is part of the overall plan for developing the hydroelectric potential of the Nelson River in Northern Manitoba, Canada. Two bipolar circuits are being installed initially on separate guyed towers along a common right-of-way. The line is 555 mi long with the normal rating of each line being 1620 mw at plus or minus 450 kv and 1800 amps, and an emergency rating of 3600 amps. The main electrical parameters of the transmission line are summarized. Twin 1.6-in. conductors were selected on the basis of loss evaluation and emergency overload capability. Grading rings will be provided on dead-end hardware only. Insulator strings were selected on the basis of normal working voltage. Ground clearances established for the HVDC line are consistent with accepted safety standards applied to HVAC transmission. The use of overhead ground wire shielding is expected to limit lightning flashovers to 2/yr/100 mi of line. (USBR)
W71-08634

CONVERSION OF HYDROELECTRIC PLANT TO REMOTE CONTROL,
North of Scotland Hydro-Electric Board, Edinburgh.
W. M. Ross, and E. G. Davidson.
Water Power, Vol 22, No 9, p 305-311, Sept 1970. 7 p, 6 fig, 1 tab.

Descriptors: Hydroelectric power, *Hydroelectric powerplants, Electric power production, Costs, *Remote control, *Automatic control, Supervisory control (Power), Foreign design practices, Communication, Telemetry, Electrical equipment.
Identifiers: Scotland, Modernizing, Communication systems, Security.

The conversion of 2 North of Scotland Hydro-Electric Board's hydroplants to remote control is described. The North of Scotland Hydro-Electric Board has 1052 mw of hydroelectric generation scattered throughout 45 stations ranging from 1 mw to 40 mw at operating heads ranging from 136 ft to 34 ft. Most plants are on semiautomatic or fully automatic control, with a few remaining on manual control. Increasing staffing costs have necessitated considering remote control for most of the small plants. Based on the total cost of conversion, the expected return on capital investment allowing for depreciation and maintenance, will be not less than 20%. Operations have been satisfactory. (USBR)
W71-08635

FREQUENCY CONTROL UNDER ISOLATED NETWORK CONDITIONS,
T. Stein.
Water Power, Vol 22, No 9, p 320-324, Sept 1970. 5 p, 8 fig, 2 tab, 8 ref.

Descriptors: *Load-frequency control, Interconnected systems, Damping, Time, Frequency shift, *Hydraulic turbines, *Governors, Investigation, Hydroelectric powerplants, Regulation, Fluctuation, Control, Frequency, Foreign research, Electrical stability, Hydroelectric power.
Identifiers: Austria, *Frequency response, Optimum performance, Sakingen Power Sta (West Germany).

Frequency behavior is important during a breakdown of interconnections to a grid leaving hydraulic turbines to supply an isolated network. Proving a governor setting which gives best control stability is not sufficient because a change of setting to improve stability may cause deterioration in frequency control with larger frequency overshoot. Good frequency control of an isolated network is essential because the relative local load variations are larger in relation to the total power than in an interconnected grid. Frequency deviation must not be limited only to satisfy requirements of the customers during the isolated operation, but also to permit easier return to the interconnected grid service as soon as possible. Based on measurements of the frequency response of hydraulic turbine governors with more than one input amplitude, a new concept has been tested to achieve optimum setting, considering the effect of nonlinearity of servomotor speed and the fact that large units cannot be tested on actual isolated networks. Frequency-response tests are discussed and evaluated. (USBR)
W71-08636

REINFORCED CONCRETE RESPONSE TO SIMULATED EARTHQUAKES,
T. Takeda, M. A. Sozen, and N. N. Nielsen.

ceedings American Society of Civil Engineers, rnal of Structured Division, Vol 96, No ST12, p 7-2573, Dec 1970. 17 p, 13 fig, 2 tab, 2 ref, 2 end.

criptors: Dynamic tests, *Dynamic response, lacements, Damping, *Earthquakes, *Rein- ed concrete, Structural engineering, Accelera- (Physics), Vibration, Simulation, Structural avior, Laboratory tests, Seismic tests, Stiffness. tifiers: Hysteresis loops, Static behavior.

forced concrete specimens were subjected to c tests and periodic and simulated earthquake ons to develop realistic analytical models for earthquake response of the elements and rials involved. During some dynamic tests, the imens responded with a displacement of the r of 6 times the initial yield deflection. The ess and energy absorbing capacity of the imens changed considerably and, at times, very lly during the dynamic tests. A realistic con- ual model for predicting the dynamic response reinforced concrete member should be based static force-displacement relationship reflect- he changes in stiffness for loading and unload- s a function of the previous loading history. dynamic response calculated on the basis of proposed force-displacement relationship d satisfactorily with the measured response. the hysteresis loops defined by the proposed -displacement relationship, invoking addi- l sources of energy absorption was not neces- for a satisfactory prediction of the dynamic nse. (USBR)
-08637

AN POWER FROM INSIDE THE EARTH,
ar.
rday Review, Vol 53, No 49, p 53-61, Dec, . 7 p, 8 fig.

riptors: *Geothermal powerplants, *Geother- tudies, Electric power, Electric power produc- Electric powerplants, Power supplies, arch and development, Environmental effects, urce development, Thermal power, Water y, Desalination.
ifiers: *Geothermal investigations, *Geother- esources.

werplant to turn geothermal steam into elec- ower is being constructed in the Mexicali Val- Mexico. The powerplant will have a capacity ,000 kw, with plans for quadrupling this out- A research program is underway to investigate opment of geothermal power north of the can Border in the Imperial Valley in Califor- The Bureau of Reclamation contributes to the rch primarily because of the possibility of icing substantial volumes of slat-free water for olorado River. The scheme is to pipe geother- heated water to the surface of the Imperial y, take off the steam to generate power, use eat remaining in the brine to evaporate the , pipe the distilled water into Lake Mead, and the geothermal reservoir underground with ater from the Pacific Ocean. The present use otential of geothermal power in the U S and parts of the world are discussed. Geothermal r can be generated more inexpensively than r from any other source and, under proper gement, is capable of enhancing rather than iorating the environment. (USBR)
08643

L REPORT AND EVALUATION OF EX- MENTAL TOWERS IN THE 230-KV GLEN YON-SHIPROCK TRANSMISSION LINE,
u of Reclamation, Denver, Colo.
enman.
u of Reclamation Report REC-ERC-71-3, 971. 21 p, 15 fig, 5 tab.

iptors: *Transmission towers, Transmission Investigations, *Erection, *Guyed towers, opters, Cranes (Hoists), Costs, Design, Relia- Feasibility, *Experimental data, Per- formance, Evaluation, Environmental effects, Maintenance.
Identifiers: Test transmission lines, *Self-support- ing towers.

Results of a 6-yr investigation program of new tower designs and erection procedures for trans- mission lines are reported. The 7-mi test section of a 230-kv transmission line near Kayenta, Ariz, con- sisted of 4 towers each of 7 types, some erected by cranes and some erected by helicopter. Installed cost data are given. The 6-yr service reliability was satisfactory for the experimental section of trans- mission line. Feasibility of helicopter erection was satisfactory. Tower designs based on guyed con- struction were acceptable. Self-supporting towers were very economical. Environmentally, use of guyed towers should be avoided near substations, highways, or in agricultural fields. Basic design data of the transmission line and tower design data are given. (USBR)
W71-08646

ENGINEERING FUNDAMENTALS INVOLVED IN BOTTOM-HOLE-TOOL DRILLING,
Mission Mfg. Co., Houston, Tex.
J. D. Gardner.
Water Well Journal, Vol 14, No 3, Mar 1960. 5 fig.

Descriptors: *Water wells, *Drilling, Rotary drilling, Drilling equipment, Drilling fluid, Oil in- dustry.
Identifiers: *Bottom-hole-tool drilling, Cable-tool drilling, Hard-rock drilling.

A major change in the basic equipment require- ments was made when rotary drilling rigs using mud were introduced to the water well industry. Since this time only the accessory equipment was needed to add air as a drilling fluid and obtain an increase in drilling rates. With the introduction of 'Bottom- Hole-Tools,' the air compressor manufacturers have kept up with their needs. It is the purpose of this paper to present the fundamentals involved in 'Bottom-Hole-Drilling.' (Campbell-NWWA)
W71-08905

A CRITICAL EXAMINATION OF ROTARY DRILLING HYDRAULICS,
Texas Univ., Austin.
T. Bourgoyne, and O. K. Kimbler.
Preprint, Society of Petroleum Engineers of AIME Paper No SPE 2386, 1969. 13 p, 2 tab, 14 fig, 20 ref.

Descriptors: *Drilling, *Rotary drilling, Drilling fluids, Drilling equipment, Oil industry.
Identifiers: *Drilling hydraulics, Bit nozzle size, Maximum bit horsepower, Maximum nozzle velocity.

A new computer technique has been developed for providing information on rotary drilling hydraulics. The computer program determines the proper bit nozzle size and pump operating conditions for all combinations of depth and mud density for a given hole size. By performing the calculations for all hole sizes used, the program completely defines op- timum hydraulics for a given rig. making repetitive calculations for each well unnecessary. The com- puter program presented was used to compare vari- ous published optimization procedures over a typi- cal range of field conditions. The optimization procedures studied were (1) establishment of max- imum jet impact force, (2) establishment of max- imum bit horsepower, (3) establishment of max- imum nozzle velocity, (4) establishment of known cleaning needs with the least pump horsepower ex- penditure, and (5) establishment of optimum bit horsepower using the Economy Method. The com- parison includes differences among the procedures in pump cost as well as the differences in the hydraulic horsepower, jet impact, and nozzle velocity of the bit. (Campbell-NWWA)
W71-08916

WHAT TO LOOK FOR IN SELECTING AIR-DRILLING FOAMING AGENTS,
Aqua-Flo Co., Nitro, W. Va.
T. Halloran.
Oil and Gas Journal, Vol. 67, No. 23, August 8, 1966.

Descriptors: *Drilling fluids, *Rotary drilling, Drilling, Drilling equipment, Oil industry.
Identifiers: *Air-drilling foaming agents, Ap- palachian fields, Detergents, Foaming methods.

To get the most out of air drilling, operators looked for better foaming agents. Most surfactants avail- able for oil-field use in the late 1950's were by- products or detergents made for other industrial, or even household uses. These products were not ver- satile enough for the wide range of oil-field condi- tions. Many of the problems with conventional de- tergents arise from their inability to work well in other than fresh water. Brine, sulfur water, and oil cause the major difficulties. Few soaps and ordina- ry detergents can give good results in every type of fluid to which they are exposed. (Campbell-NWWA)
W71-08924

AUTOMATION OF SMALL RURAL WATER SUPPLY SYSTEMS (RUSSIAN: AVTO- MATIZATSIYA MALYKH SISTEM SEL'SKOK- HOZYAYSTVENNOGO VODOSNABZHENIYA),
A. I. Fabrikov, and L. S. Blagovestnyy.
Gidrotekhnika i Melioratsiya, No 1, p 84-89, January 1971. 6 p, 3 fig, 1 tab.

Descriptors: *Automation, *Water supply, *Pumps, Water delivery, Discharge (Water), Rural areas, Equipment.
Identifiers: *USSR, Water pipes.

Automation of rural water supply lines will result in significant economic gains by reducing the cost of maintenance and by increasing the discharge and smooth-flowing operation of pump units. Existing rural supply lines can be automated without great capital expense, particularly if one uses the auto- matic pressure limit switch disigned by the Southern Scientific Research Institute of Hydraulic Engineering and Reclamation. The switch is quite simple in design. Its most vital component is the diaphragm. Laboratory and production tests of various diaphragms have shown that polymer materials have great residual deformations result- ing in disturbances in the adjustment. Tests of rubber diaphragms reveal a lesser disturbance in the original adjustment. The minimum limit of level adjustment achieved to date--3 m of water column- -is considered to be satisfactory. (Josefson-USGS)
W71-08933

8D. Soil Mechanics

A METHOD OF PROTECTING BANKS OF THE AMU-DARYA RIVER (RUSSIAN: SPOSOB KREPLENIYA BEREGOV REKI AMU-DAR'I),
N. I. Kryuchkov, and V. V. Mlynskiy.
Gidrotekhnika i Melioratsiya, No 1, p 44-47, Jan 1971. 4 p, 2 fig.

Descriptors: *Bank protection, *Bank stabilization, *Bank erosion, *Coastal structures, *Trenches, Coastal engineering, Erosion, Discharge (Water), Meanders, Clays, Alluvial channels, River training.
Identifiers: *USSR, Karakaplak ASSR, Amu-Darya River, Bottom erosion, Angle of repose.

The Takhiatash water engineering system on the Amu-Darya River is being built in an unstable river channel. Discharge of the river ranges from 100 to 8,000 cu m/sec. Sharp changes in the slopes of the water surface (from 0.0001 to 0.0002) produce a meandering channel on the alluvial-delta plain of the river. To protect the banks of the river it is recommended that rocks be dumped into ex- cavated trenches along the projected line of ero- sion, provided that rock interlayers or thick layers

of clay are present at the bottom limits of the erosion. By using this method river banks may be given the necessary configuration and the direction of flow may be changed at will. (Josefson-USGS)
W71-08584

AN EXTENSION TO THE THEORY OF THE CONSTANT HEAD IN SITU PERMEABILITY TEST,
London Univ. (England).
R. E. Gibson.
Geotechnique, Vol 20, No 2, p 193-197, June 1970. 5 p, 2 fig, 19 ref.

Descriptors: *Permeability, Permeability coefficients, Bibliographies, *Permeability tests, *In situ tests, Theory, Soil tests, Soil mechanics, Piezometers, Pore water pressure, Flow rates, Theoretical analysis, Soil investigations, Soils, Analysis, Foreign research.
Identifiers: Great Britain.

The theory of the in situ constant head permeability test (Gibson 1963) is strictly valid only if the soil behaves as a porous perfectly elastic medium. For this ideal soil, the flow rate is given by an expression which holds not only for inflow and outflow tests, but also for either a rigid or an infinitely compressible piezometer tip--a spherical cavity. The theory has been extended to take account of the anelastic behavior of real soils. The piezometer compressibility, the magnitude of the pore water pressure parameter of the surrounding soil, and the direction of flow all have an important influence on the relation between flow rate and time. (USBR)
W71-08623

GROUND MOTIONS FROM VIBRATORY ROLLER COMPACTION OF COHESIVE SOIL,
Bureau of Reclamation, Denver, Colo.
D. A. Tiedemann.
Bureau of Reclamation Report REC-OCE-70-28, June 1970. 23 p, 12 fig, 7 tab, 9 ref, append.

Descriptors: *Soil compaction, *Soil dynamics, Soil mechanics, Tamping rollers, Soil tests, Compaction equipment, Compaction tests, Test fills, Instrumentation, Rolled fills, *Vibration, *Vibratory compaction, Field tests, *Cohesive soils, Electronic equipment, Accelerometers, Effects, Acceleration (Physics), Embankments, Seismic waves, Damages.
Identifiers: Cawker City Dike (Kans) , Vibratory rollers.

A field test was conducted to obtain information concerning the compaction characteristics of a vibratory sheepsfoot roller used in constructing an embankment of cohesive soil. As a part of the test, the magnitude of ground motions produced by the vibratory roller was measured. Measurements were obtained by installing 5 triaxial sets of accelerometers in the embankment as construction progressed. Measurements were obtained over horizontal distances of 0 to 50 ft and depths ranging from about 2.0 to 22.5 ft. Results indicated that: (1) relatively high ground motions were produced in the immediate vicinity of the roller, with accelerations exceeding 1 g up to a depth and distance of 5 ft from the roller; (2) vibrations were directional, with the vertical components to the front of the roller being 2 to 3 times greater than those to the side; (3) higher ground motions were produced by the roller when stationary than when moving; (4) the magnitude of ground motions appeared to depend on the moisture content of the soil directly beneath the roller; (5) the phenomenon of beating occurred when 2 rollers were operated near each other; and (6) based on available damage criteria, the risk of damage should be considered when the roller is operated near structures. (USBR)
W71-08624

THE FACTOR OF SAFETY AGAINST UNDRAINED FAILURE OF A SLOPE,
Melbourne Univ. (Australia).
P. J. Moore.
Soils and Foundations, Vol 10, No 3, p 81-91, Sept 1970. 11 p, 9 fig, 10 ref.

Descriptors: *Slope stability, *Stability analysis, *Safety factors, Slopes, Embankments, Earth dams, Shear failure, Pore pressure, Effective stress, Shear strength, Shear stress, Soil mechanics, Equations, Foreign research, Failure (Mechanics), Slip-circle method.
Identifiers: Undrained shear strength, Friction circle method, Bishops method, Fellenius method, Australia.

Conventionally in the Fellenius, Bishop, and friction circle methods of slope stability analysis, the factor of safety is defined in terms of the failure shear stress that may be mobilized at the existing in situ value of effective normal stress. Additional pore pressure change (positive or negative) that may occur between the in situ state and the failure state when the possibility of undrained failure is being examined is not considered. The safety factor for undrained failure of a slope is redefined in terms of the shear stress on the failure plane at failure, and equations are derived for the above 3 methods of stability analysis that allow for the development of additional pore pressures. The redefinition of the factor of safety is more logical and more valid than the conventional definition. The equations are applied to the analysis of the failure of the Seven Sisters embankment in Canada. (USBR)
W71-08629

NONLINEAR ANALYSIS OF STRESS AND STRAIN IN SOILS,
California Univ., Berkeley; and Woodward-Clyde-Sherard and Associates, Oakland, Calif.
J. M. Duncan, and C-Y Chang.
Proceedings, American Society of Civil Engineers, Journal of Soil Mechanics and Foundations Division, Vol 96, No SM5, p 1629-1653, Sept 1970. 25 p, 19 fig, 1 tab, 27 ref, 2 append.

Descriptors: Soil investigations, *Soil mechanics, *Strain, Analytical techniques, Soil properties, *Soils, Soil tests, *Finite element method, *Stress-strain curves, *Stress, Stress analysis, Computer applications, Footings, Settlement (Structural), Bibliographies, Triaxial tests.
Identifiers: *Nonlinear properties.

The availability of high-speed computers and powerful numerical analytical techniques such as the finite element method have enabled approximating nonlinear, inelastic soil behavior in stress analysis. Nonlinear stress analyses of soils require descriptions of the stress-strain behavior of the soil in quantitative terms and techniques for incorporating the behavior in the analyses. A simple, practical stress-strain relationship representing the nonlinear, stress-dependent, inelastic stress-strain behavior of soils is described. The relationship is convenient for use with the finite element method of analysis. Values of the required parameters used in the relationship can be derived from the results of standard triaxial tests or plane strain compression tests involving primary loading, unloading, and reloading. Comparisons of calculated and measured strains in specimens of dense and loose silica sand showed that the relationship was capable of accurately representing the behavior of the sand under complex triaxial loading conditions, and analyses of the behavior of footings on sand and clay showed that finite element stress analyses conducted using the relationship agreed well with empirical observations and applicable theories.
W71-08630

SEISMIC SAFETY OF EARTH DAMS,
Ohio State Univ., Columbus; and Auburn Univ., Ala.
T. H. Wu, and L. M. Kraft, Jr.
Proceedings, American Society of Civil Engineers, Journal of the Soil Mechanics and Foundations Divisions, Vol 96, No SM6, p 1987-20006, Nov 1970. 20 p, 9 fig, 5 tab, 26 ref, 2 append.

Descriptors: Dams, *Earth dams, *Dam desig
*Seismic stability, Loads (Forces), Seismic desig
Decision making, Slope stability, Earthquake
Safety factors, Safety, Soil mechanics, Risk
Earthquake loads, Dynamic response, Statistic
analysis, Probability, Optimum design, Costs, Sc
properties, *Optimization, Bibliographies, She
strength, Dam failure.

Use of statistical decision theory to choose an o
timum safety probability in earth dam design is
lustrated conceptually. The safety of a homogen
ous earth dam designed by a set of procedur
deemed representative of current practice is co
sidered. Based on published research results, va
ous uncertainties and errors are evaluated and us
to compute the failure probability of an earth d
located in a seismic region. Decision theory is us
to obtain the optimum design. This approach p
mits evaluating the effects of various uncertaint
on the safety and cost of an earth dam and provi
a basis for choosing design parameters. Examp
illustrate numerically the effect of seismici
material properties, and failure cost on design a
expected cost. (USBR)
W71-08638

HYDRAULIC MODEL STUDIES OF TIB DAM AUXILIARY OUTLET WORKS MISSO RI RIVER BASIN PROJECT MONTANA,
Bureau of Reclamation, Denver, Colo. Engineer and Research Center.
G. L. Beichley.
Available from the National Technical Informat Service as PB-197 834, $3.00 in paper copy, $0 in microfiche. Bureau of Reclamation report RI OCE-70-44 Oct 1970. 34 p.

Descriptors: *Earth dams, *Outlet works, *Re voirs, *Model studies, Irrigation press Drainage, Montana, Stilling basins, Slide gates.
Identifiers: *Drop inlets, *Tiber Dam, *Miss River Basin Project.

The existing canal outlet works tunnel at T Dam, Mont, is used as an intake and as the stream portion of an auxiliary outlet w designed to provide additional reservoir rel capacity. The existing 17-ft-dia horseshoe free tunnel is converted to a 15-ft 6-in.-dia pressure nel and is connected to a new 10-ft 9-in.-dia tu by a drop inlet and vertical bend. The smaller nel is equipped with a 7.25- by 9.25-ft slide and terminates in a stilling basin in the river c nel. A 1:17.53 scale model was used to develop hydraulic design of the auxiliary outlet work cluding: the drop inlet and vertical bend from existing canal outlet works tunnel, and the tr tion in the tunnel downstream from the chamber. Details of the model testing and rec mended modifications to the preliminary de prompted by the testing are presented.
W71-08864

AGING EFFECTS ON SWELL POTENTIAL COMPACTED CLAY,
Technion - Israel Inst. of Tech., Haifa (Isr
Dept. of Civil Engineering.
For primary bibliographic entry see Field 02G.
W71-08904

8E. Rock Mechanics and Geology

PHASE COMPOSITION OF PORE WATE COLD ROCKS,
Cold Regions Research and Engineering Hanover, N.H.
For primary bibliographic entry see Field 02G
W71-08504

WATER FLOWS IN FISSURED ROCK THEIR EFFECTS ON THE STABILITY ROCK MASSIFS,
Karlsruhe Univ. (West Germany).

laude Louis.
vailable from the National Technical Information ervice as UCRL-Trans-10469, $3.00 in paper opy, $0.95 in microfiche. Ph D Thesis, Karlsruhe niversity, May 1970. 207 p, 79 fig, 52 ref.

escriptors: *Engineering geology, *Groundwater ovement, *Hydrostatic pressure, *Rock echanics, *Fissures (Geology), Aquifer characristics, Porous media, Aquifers, Joints (Geology), actures (Geology), Foundation rocks, Landdes, Dam failure, Structural geology.
entifiers: Fissured rocks, *Engineering hydrolo-

the engineering sciences the study of the stability rock massifs is among the trickiest problems that e can encounter. The complexity of the problem increased by the fact that, under natural condiins, rock massifs are fissured. Because of this fisring, rock massifs are not homogeneous and otropic media. Water-flow phenomena in rock assifs are analyzed taking into account the isotropy due to fissuring. Some analytic methods e given for determining the static and dynamic tions of the water in fissured media. These flow rces can then be introduced into stability alyses. (Knapp-USGS)
71-08544

MEANS OF DETERMINING THE OMPLETE STATE OF STRESS IN A SINGLE OREHOLE,
yoto Univ. (Japan); and British Columbia Univ., ancouver.
Oka, and I. Bain.
ternational Journal of Rock Mechanics and Min- g Science, Vol 7, No 5, p 503-515, Sept 1970. 13 11 fig, 1 tab, 1 ref, append.

escriptors: *Rock mechanics, *Rock tests, Rock essures, Boreholes, In situ rock, *In situ tests, eld tests, Stress, Calibrations, Stress relieving, Inrumentation, Measuring instruments, Strain, ethodology, Displacements, Stress analysis, ress distribution, Foreign research, Equations, athematical analysis, Analytical techniques.
entifiers: *Overcoring method, Japan, Canada.

quations for determining the complete state of ress in a rock mass from a single borehole are erived. Instrumentation that will measure enough mponents of displacement of the walls of a single vercored borehole to permit computation of the mplete stress ellipsoid is proposed. A new device pable of measuring 3 vectors of axial displaceent is described. Coefficients derived from tablished formulae are used in computing the in u stress tensor. Calibration of the measuring stem using 4 test blocks of rock with various ientations of boreholes and loading directions is plained. Calibration eliminates the need for using astic constants which allow determination of resses in heterogeneous rock. Because only resses of equilibrium are involved, a soft or rigid pe of measuring instrument may be used. USBR)
71-08628

NIAXIAL TESTING IN ROCK MECHANICS ABORATORIES,
heffield Univ. (England).
Hawkes, and M. Mellor.
ngineering Geology, Vol 4, No 3, p 179-285, 970. 107 p, 37 fig, 9 tab, 131 ref, 4 append.

escriptors: *Rocks, Samples, Compression tests, aboratory tests, *Test procedures, Equipment, rrors, Deformation Bibliographies, *Rock echanics, *Rock properties, *Rock tests, Tension sts, Tolerances (Mechanics), Fractures.
lentifiers: Uniaxial tests.

aboratory testing of rock specimens in uniaxial nsion and compression is reviewed, with the aim f selecting equipment, procedures, and tolerances s a basis for test standardization. Major topics of he review include composition, condition and preparation of test materials, theoretical background of deformation and fracture in rocks, detailed mechanics of uniaxial laboratory tests, and practical test procedures. (USBR)
W71-08648

A LABORATORY STUDY OF ROCK BREAKAGE BY ROTARY DRILLING,
California Univ., Berkeley.
W. H. Somerton.
Journal Petroleum Technology, Vol 219, No 5, p 92-97, May 1959. 11 fig, 3 tab, 10 ref.

Descriptors: *Drilling, *Rotary drilling, Oil industry, Drilling equipment, Rock mechanics.
Identifiers: *Drilling variables, Turbodrill, Energy considerations, Bit wear studies, Drilling chip analyses, Drilling efficiency.

The effects of drilling variable on rotary drilling rates and efficiencies have been studied by a series of laboratory drilling test. Two-cone 1.25-in. diameter bits were used to drill vertically upwards into rock samples at controlled weights and rates of rotation. Shale, sandstone and specially prepared concrete samples were used in this study. Power input to the drilling system was measured and drilling chips collected for energy -- size reduction studies. Reasonably good correlations between drilling variables and rates of penetration were found. Quantities that are difficult to evaluate include rock strength parameters and the effects of bit wear. Effects of bit size and geometry require further investigation. Analysis of the drilling chips confirmed the premise that, for rocks containing two or more mineral constituents of different strengths, a greater amount of rock breakage occurs in the weaker constituent. Drilling conditions which required greater amounts of energy produced finer drilling chips. As bit tooth wear progressed, drilling chips became finer. Efficiency of rotary drilling as a rock breakage mechanism was extremely low. Comparison was made with theoretical energy requirements and with energy requirements for size reduction by comminution methods. (Campbell-NWWA)
W71-08845

8F. Concrete

PLACEMENT OF CONCRETE IN MASSIVE HYDRAULIC STRUCTURES BY USING PRECAST SEPARATING ELEMENTS,
R. N. Petrashen.
Hydrotechnical Construction, No 1, p 23-27, Jan 1970. 5 p, 9 fig, 3 ref.

Descriptors: *Concrete dams, *Concrete placing, Construction, *Foreign design practices, Foreign construction, Formwork (Construction), Gravity dams, Temperature control, Cracking, Grouting, Shear forces, Hydraulic structures, Construction costs, Reliability, Construction methods, *Dam construction.
Identifiers: USSR.

Soviet engineers are using a new method of placing concrete in large hydraulic structures being built under severe climatic conditions. The method consists of systematic use of internal precast embedded forms as elements permitting the division of the structure into separate blocks. By using this method, the entire concrete-placing scheme is basically modified, converting it into a continuous process of gradual construction of the dam by layers. The method involves uninterrupted placement of concrete, beginning at the upstream side and progressing to the downstream side, by placing blocks with embedded separating elements. The distance between the elements is established so that no formation of temperature cracks occurs during cooling of the dam. The embedded elements in each higher layer are displaced toward the downstream side to form a stepped joint which can adequately transfer shearing forces from the upstream to the downstream side. Details of the construction method are discussed. (USBR)
W71-08626

LOWER-BOUND OPTIMAL DESIGN OF CONCRETE STRUCTURES,
Monash Univ., Clayton (Australia); and Waterloo Univ. (Ontario).
G. I. N. Rozvany, and M. Z. Cohn.
Proceedings, American Society of Civil Engineers, Journal of the Engineering Mechanics Division, Vol 96, No EM6, p 1013-1030, Dec, 1970. 18 p, 7 fig, 1 tab, 13 ref, 2 append.

Descriptors: *Limit design, *Reinforced concrete, Concrete structures, Continuous frames, Continuous beams, Design, *Optimization, Constraints, Engineering mechanics, *Optimum design, Load distribution, Axial loads, *Linear programming, Reinforcing steels, Stiffness.
Identifiers: Yielding, Concrete slabs.

A formulation of the optimal frame and slab problems is presented, in which specified serviceability and collapse criteria are satisfied in addition to the objective of minimizing the material consumption. The approach: (1) considers alternative loading conditions, (2) is based on the lower bound principle, and (3) with appropriate assumptions, leads to the solution of a linear programing problem. Examples of application to a 2-bay frame and a circular slab illustrate the approach. Possible refinements such as the consideration of axial forces and nonlinearity of the moment-steel area relation are investigated. (USBR)
W71-08642

PORTLAND CEMENT CONCRETE--RESEARCH, TESTING, AND PERFORMANCE,
Waterways Experiment Station, Vicksburg, Miss.
B. Mather.
Journal of Materials, Vol 5, No 4, p 832-841, Dec, 1970. 10 p.

Descriptors: *Concrete technology, Concretes, Admixtures, Performance, Aggregates, Concrete construction, Concrete tests, Nondestructive tests, Chemical properties, Abrasion resistance, Research and development, Data processing, Particle distribution, Particle size, Statistical analysis, *Portland cements, Spectroscopy, X-ray diffraction, *Reviews.
Identifiers: American Society for Test and Mat, American Concrete Inst, Portland Cement Association, Marburg Lecture.

Selected aspects of the state-of-the-art of predicting performance of portland cement concrete in service are reviewed. The role of research in evaluating the performance and guiding the development of tests is discussed. Remarkable progress has been made, but much remains to be done to provide basic and fundamental knowledge of the phenomena, the substances, and the environment of service. A better understanding of the nature and formation processes of the bonds that give concrete strength, the processes by which the bonds become broken, and the critical levels of interacting environmental factors that produce irreversible changes in concrete in service is needed. Such research results will permit the planning of experiments that will yield data to establish relations between levels of relevant properties and performance in levels of environmental influences. From such relations, performance may be predicted; from such predictions, test methods and specifications can be established. (USBR)
W71-08647

CEMENTING SMALL WELLS,
Miller (J. P.) Artesian Well Co., Brookfield, Ill.
For primary bibliographic entry see Field 08A.
W71-08667

DETERIORATED CONCRETE IN NORTH PLATTE RIVER PROJECT SUBSTATIONS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
L. C. Porter.

Available from the National Technical Information Service as PB-197 844, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation Report REC-ERC-71-7, Jan 1971.

Descriptors: *Concretes, *Concrete testing, *Cracks, *Foundations, Deterioration, Failures, Concrete constructions, Substations, Alkali-aggregate reaction.
Identifiers: *Foundation deterioration, Aging tests, Materials, Visual inspection, Silicon dioxide, Nebraska, Wyoming, North Platte River, Concrete cores.

Inspection of several electrical substations of the Bureau of Reclamation shows concrete in various stages of deterioration from severe to slight cracking. Concrete cores obtained from visibly deteriorated foundations at Bridgeport and Sidney, Nebr, and Laramie, Wyo, show damage from a variety of causes. Bridgeport deterioration is attributed principally to fire damage. Sidney concrete is seriously deteriorated, badly cracked, and crumbly. In the absence of complete construction records, inadequate inspection and poor-quality workmanship are the suspected causes. Concrete in Laramie Substation is deteriorating from alkali-silica aggregate reaction.
W71-08868

8G. Materials

SELECTION OF CHEMICAL GROUT FOR MATTMARK DAM,
Massachusetts Inst. of Tech., Cambridge; and Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau and Erdgau.
H. H. Einstein, and G. Schnitter.
Proceedings, American Society of Civil Engineers, Journal of the Soil Mechanics and Foundations Division, Vol 96, No SM6, p 2007-2023, Nov 1970. 17 p, 14 fig, 17 ref, append.

Descriptors: *Chemical grouts, Dams, Hydraulic structures, *Grouting, *Grout curtains, Laboratory tests, Leaching, *Evaluation, Permeability, Soil mechanics, Viscosity, Stability, Injection, Foreign research, Soil investigations, Shrinkage, Deformation, Deterioration, Seepage control, Bibliographies, Dam foundations, Cutoffs, Overburden.
Identifiers: Gelation, Switzerland, Mattmark Dam (Switzerland).

Four chemical grouts, 2 nearly identical sodium silicates (algonite and consonda), and 2 polymers (bakelite and polythixon) underwent extensive laboratory evaluation. First, the grouts were examined with regard to viscosity--time behavior, gelation time, temperature-influence, stability, deformability, and toxic properties. Bakelite was eliminated because of rigid deformability. The second step tested grout-soil interaction: the injectability and permeability reduction of algonite and polythixon were examined in laboratory injection tests. Both grouts reduced permeability by an order of magnitude, but polythixon was eliminated because of limited injectability. Finally, long-term leaching tests on algonite were performed to investigate the effect of syneresis. Satisfactory results led to the recommendation of algonite for eventually successful application. The evaluation procedure used is generally valid for any grout selection. (USBR)
W71-08639

8H. Rapid Excavation

POWERFUL BOREHOLE SLURRY PASSES FIELD TESTS,
Western Co. of North America, Richardson, Tex.
A. M. Spencer, A. L. Anderson, and G. R. Dysart.
World Oil, Vol 171, No 6, Nov 1970. 3 fig, 1 tab, 8 ref.

Descriptors: *Rock mechanics, Boulders, *Water wells, Aquifer characteristics, Oil industry, Drilling, *Explosives, *Excavation, Wells.
Identifiers: Tensile failure, Random fracturing, Slurry explosives, Stimulation depth.

The most powerful commercially available explosive is used in a versatile and safe slurry form to release high energy in the wellbore. Sustained 200 bopd increases from explosive fracturing have occurred in field tests in producing oil wells. Key features of the method are wellbore loading with bagged or high viscosity explosive, and solid tamping with cement and gravel. Advantages of the system are: (1) Good explosive-to-formation contact gives maximum energy transfer, (2) High stresses near wellbore cause desirable random fracturing, (3) Concentrated explosive generates highest volume of gases for fracture extension, (4) Casing is not damaged with protective tamping, (5) Cost compares with hydraulic fracturing and (6) The method has applicability to water well development. (Campbell-NWWA)
W71-08476

MATERIALS HANDLING FOR TUNNELING,
Holmes and Narver, Inc., Los Angeles, Calif. Advanced Technology Div.
J. M. Duncan, M. P. Tierney, and H. V. Schneider.
Available from the National Technical Information Service as PB-197 331, $3.00 in paper copy, $0.95 in microfiche. Final Report for Office of High Speed Ground Transportation, Urban Mass Transit Administration, Oct 1970. vp.

Descriptors: *Tunnel, *Excavation, Materials, Mathematical models, Tunneling machines, Tunnel linings, Pipelines, Construction costs.
Identifiers: *Subway railways, Hydraulic conveyors, Pneumatic conveyors, Underground surveys.

At the tunnel face advance rates anticipated for the future, material handling could become the critical factor in the tunneling project. All functional elements of the tunneling process require materials to be moved by the materials handling system. The characteristics, quantities, and flow of muck, ground support materials, materials for transport system extension, personnel, and other materials and equipment which must be transported between the surface and the work zones are defined. Candidate transport modes to meet the requirements of the future are classified as continuous flow systems or unitized transport systems. Conveyors, hydraulic pipelines, and pneumatic pipelines are selected as representative of continuous flow systems. Conventional dual rail systems with locomotive drive, sidewheel drive and cable drive, siderail systems, monorail systems, hoists, and truck systems are selected for evaluation in the unitized category. These ten transport modes are described, discussed, and analyzed through computerized mathematical models representing the cost/performance relationship for each system. Integrated systems including all elements of the total materials transport system throughout its total life cycle are conceived and analyzed. Based on the results of these evaluations and analyses, areas are identified for beneficial allocation of research and development resources to advance the state of the art of materials handling for tunneling.
W71-08668

THE SEAFLOOR EXCAVATOR, VOLUME II,
Northrop Corp., Anaheim, Calif. Electro-Mechanical Div.
C. P. Buckley, F. S. Coxe, and O. Shev.
Available from the National Technical Information Service as AD-720 339, $3.00 in paper copy, $0.95 in microfiche. Naval Civil Engineering Laboratory Contract Report CR-71.003, Dec 1970, v.p. 66 refs.

Descriptors: *Earth-handling equipment, *Beds under water, *Hydraulic systems, *Dredging, Excavation, Hydraulic systems.
Identifiers: *Ocean bottom, Underwater vehicles, Deep submergence, Power supplies, Ballast, Data transmission systems, Underwater equipment, Environmental tests, *Seaflower excavators, *Underwater excavation, Underwater construction.

The system definition and analysis process through which a deep-ocean Seafloor Excavator developed is described. Eight concepts are initially formulated and studied, with the three most practical being further developed. A comprehensive system and cost analysis of the three selected concepts is performed to determine the single, most effective concept. The preliminary design and the design specifications for this concept are developed. The resulting design is of a wide-tracked, remotely operated submersible vehicle equipped with a revolving, extendable (jackknife) dredging arm capable of performing earthmoving excavating dredging tasks in waters as deep as 600 feet. This report is comprised of four volumes. Volume I contains the summary, Volume II contains the preliminary design and specifications, Volume III contains the concept definition and system analysis studies conducted to establish the preliminary design requirements, and Volume IV contains supporting and supplemental data developed during the course of this program. (See also W71-08867)
W71-08866

THE SEAFLOOR EXCAVATOR, VOLUME III,
Northrop Corp., Anaheim, Calif. Electro-Mechanical Div.
C. P. Buckley, F. S. Coxe, and O. Shev.
Available from the National Technical Information Service as AD-720 340, $3.00 in paper copy, $0.95 in microfiche. Naval Civil Engineering Laboratory Contract Report CR-71.003, Dec 1970.

Descriptors: *Earth-handling equipment, *Beds under water, *Dredging, *Hydraulic systems, Excavation, Trafficability, Buoys, Reliability, Costs.
Identifiers: *Ocean bottom, Environmental tests, Marine engineering, Underwater vehicles, Deep submergence, Booms, Underwater equipment, *Seafloor excavators, *Underwater excavation, Underwater construction.

The system definition and analysis process through which a deep-ocean Seafloor Excavator developed is described. Eight concepts are initially formulated and studied, with the three most practical being further developed. A comprehensive system and cost analysis of the three selected concepts is performed to determine the single, most effective concept. The preliminary design and the design specifications for this concept are developed. The resulting design is of a wide-tracked, remotely operated submersible vehicle equipped with a revolving, extendable (jackknife) dredging arm capable of performing earthmoving excavating dredging tasks in waters as deep as 600 feet. This report is comprised of four volumes. Volume I contains the summary, Volume II contains the preliminary design and specifications, Volume III contains the concept definition and system analysis studies conducted to establish the preliminary design requirements, and Volume IV contains supporting and supplemental data developed during the course of this program. (See also W71-08866)
W71-08867

8I. Fisheries Engineering

THE MARINE AND COASTAL FISHERIES STATIONS OF THAILAND,
Alabama Agricultural Experiment Station, Auburn.
H. S. Swingle, and R. O. Smitherman.
Available from the National Technical Information Service as PB-195 911, $3.00 in paper, $0.95 microfiche. July 30, 1969. 22 p, 17 fig.

Descriptors: *Fisheries, *Stations, *Fish farms, *Research facilities, Equipment, Ponds.

entifiers: *Thailand.

e Thailand marine stations at Phuket and yong, the coastal stations at Prachuap Khiri an, Chantaburi and Songkla and the shrimp sta- ns at Samut Sakhon are described. The research ojects, personnel, facilities, transportation and uipment are presented for each station. (Ensign- l)
71-08743

FECTS OF GRAVEL CLEANING ON BOT- M ORGANISMS IN THREE SOUTHEAST ASKA STREAMS,
cific Northwest Forest and Range Experiment tion, Juneau, Alaska.
lliam R. Meehan.
ogressive Fish-Culturist, Vol 33, No 2, p. 107- , Apr 1971.

scriptors: *Benthic fauna, *Stream improve- nt, *Sedimentation, *Streambeds, Inver- rates, Aquatic insects, Amphipoda, Annelids, aska, Pacific coast region.
ntifiers: *Gravel cleaning, *Sediment reduction, fer sifter, Southeast Alaska.

Sections of streambed in three southeast Alaska streams were cleaned by means of a mechanical 'riffle sifter.' Bottom fauna populations were sampled before and after gravel cleaning to determine the effect of this operation on fish food organisms. Results indicate that invertebrate populations were reduced as a result of cleaning, but that they returned to pre-treatment levels of abundance within a year after gravel cleaning.
W71-08853

10. SCIENTIFIC AND TECHNICAL INFORMATION

LITERATURE SURVEY: THE USE OF BACTERIA AS INDICATORS OF FAECAL POLLUTION IN WATER,
Council for Scientific and Industrial Research, Pretoria (South Africa). National Inst. for Water Research.
For primary bibliographic entry see Field 05B.
W71-08425

LAKE AND RIVER POLLUTION, AN ANNOTATED BIBLIOGRAPHY,
For primary bibliographic entry see Field 05B.
W71-08498

GEOLOGICAL SURVEY RESEARCH 1970, CHAPTER A.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W71-08532

FECAL CONTAMINATION OF FRUITS AND VEGETABLES DURING CULTIVATION AND PROCESSING FOR MARKET, A REVIEW,
Environmental Protection Agency, Cincinnati, Ohio. Div. of Water Hygiene.
For primary bibliographic entry see Field 05A.
W71-08826

BIBLIOGRAPHY ON NORTHERN SEA ICE AND RELATED SUBJECTS,
Canada Ministry of Transport, Ottawa (Ontario). Marine Operations; and Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02C.
W71-08920

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W71-08545 03C

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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

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1 NATURE OF WATER

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4 WATER QUANTITY MANAGEMENT AND CONTROL

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VOLUME 4, NUMBER 17
SEPTEMBER 1, 1971

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se of funds for printing this publication approved by the Director of the Bureau of the Budget, September 4, 1968.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

RAINFALL-RUNOFF-HYDROGRAPH RELATIONS FOR NORTHERN LOUISIANA,
Geological Survey, Baton Rouge, La.
V. B. Sauer.
Louisiana Department of Public Works Technical Report No 3, 1970. 33 p, 8 fig, 4 tab, 29 ref.

Descriptors: *Rainfall-runoff relationships, *Louisiana, *Streamflow forecasting, *Base flow, *Surface runoff, *Structural design, River flow, Regulated flow, Natural flow, Discharge measurement, Gaging stations, Water measurement, Rainfall disposition, Rain gages, Rainfall intensity, Runoff forecasting, Hydrologic data, Data collections, Meteorological data, Climatic data, Unit hydrographs, Hydrograph analysis, River forecasting, Storm runoff, Precipitation excess.
Identifiers: *Ouachita River (La), *Red River (La), *Louisiana Coastal Plain.

Streamflow records from 22 gaging stations and more than 90 rain gages were used to study the relation between rainfall, rainfall excess, and runoff hydrographs in northern Louisiana. Unit hydrographs were developed from the streamflow records and regionalized for use at any site in the study area. The regionalized dimensionless unit hydrograph can be converted to a specific unit hydrograph for a site from known values of drainage basin size and length and an estimated value of lag time. Basin lag time, a critical factor, is related to basin characteristics and, inversely, to total volume of rainfall excess for a given storm. The accuracy of the lag time and unit-hydrograph relations is fairly good if the true amount of rainfall excess is known. A random test indicated a standard error of estimate of 22 percent. (Glasby-USGS)
W71-09087

CALCULATING RAINFALL RUNOFF LOSSES BY PRECIPITATION AND RUNOFF OF SMALL RIVERS USING THE DNIEPER RIVER-RECHITSA BASIN AS AN EXAMPLE (RUSSIAN: VYCHISLENIYE POTER' DOZHDEVOGO STOKA PO OSADKAM I STOKU MALYKH REK NA PRIMERE BASSEYNA R. DNEPRA DO G. RECHITSY),
For primary bibliographic entry see Field 02E.
W71-09128

STUDY OF THE RELATIONSHIP BETWEEN ANNUAL RUNOFF OF RIVERS OF THE USSR AND ATMOSPHERIC CIRCULATION (RUSSIAN: ISSLEDOVANIYE ZAVISIMOSTI GODOVOGO STOKA REK SSSR OT ATMOSFERNOY TSIRKULYATSII),
A. A. Aniskina.
In: Problems in Hydrological Forecasting (Voprosy gidrologicheskikh prognozov), Gosudarstvennyy ordena Trudovogo Znameni Gidrologicheskiy Institut Trudy, No 179; Gidrometeoizdat, Leningrad, p 63-98, 1970. 36 p, 8 fig, 3 tab, 20 ref.

Descriptors: *Hydrologic cycle, *Rivers, *Runoff, Air circulation, *Moisture content, River basins, Precipitation (Atmospheric), River forecasting, Meteorological data, Distribution patterns, Synoptic analysis, Cyclones, Anticyclones.
Identifiers: *USSR, European USSR, Western Siberia, Synoptic processes.

Long-term fluctuations in the water content of lowland rivers of the USSR are dependent upon fluctuations in atmospheric circulation expressed as an alternating occurrence of one or two of the three types of atmospheric circulation--western, meridional, and eastern. Annual runoff data are given for 31 rivers of the European USSR with basin areas ranging in size from 3,780 to 48,300 sq km and for 39 rivers in the Asiatic part of the Soviet Union, several of which have basin areas over 100,000 sq km. To determine the character of the relationship of water content to different types of atmospheric circulation, a study was made of the distribution of cyclone and anticyclone activity and of precipitation anomalies peculiar to each circulation type. Fluctuations in the water content of rivers of several geographical regions for the period 1921-1962 are related to fluctuations in the recurrence of any two types of circulation. In some regions correlation indices of the relationship are 0.65-0.70. In predicting atmospheric circulation the relationships of water content to the three circulation types can be used as a basis for preparing long-term forecasts for USSR rivers. (Josefson-USGS)
W71-09136

A STUDY OF PRECIPITATION, STREAMFLOW, AND WATER USAGE ON THE UPPER RIO GRANDE,
Environmental Science Services Admin., El Paso, Tex.; and Bureau of Reclamation, El Paso, Tex.
Elden V. Jetton, and James W. Kirby.
Texas University Atmospheric Science Group Report No 25, June 1970. 203 p, 45 fig, 31 tab, 43 ref, append.

Descriptors: *Rainfall-runoff relationships, *Water balance, *Rio Grande, *Colorado, *New Mexico, Evapotranspiration, Irrigation water, Phreatophytes, Streamflow, Hydrologic budget, Climatology, Droughts, Water supply, Water yield, Water utilization, Consumptive use, Water allocation (Policy).
Identifiers: Upper Rio Grande Basin.

The upper Rio Grande watershed is one of the oldest inhabited, oldest irrigated, and fastest growing sections of the United States. The water resources of the basin may be overcommitted under the present form of usage. Drought during the late 1940's and the 1950's caused disastrous reductions in streamflow. Water delivered to New Mexico and Texas declined much more than did the annual rainfall over the Rio Grande Basin in Colorado or the streamflow upstream of areas of significant diversions and use. Part of the cline in surface water production may be attributable to small conservation tanks and other water-retarding developments. The loss of water in the Middle Section to nonbeneficial evapotranspiration is estimated at over one-half million acre-feet. Deliveries under the Rio Grande Compact have not closely reflected climatological or hydrological conditions. The economic effects caused by the reduction of water in the lower reaches of the basin have been very severe. The principal cause seems to be stream depletions in Colorado. (Knapp-USGS)
W71-09310

RIVER RUNOFF - THEORY AND ANALYSIS,
For primary bibliographic entry see Field 02E.
W71-90278

2B. Precipitation

HYDROLOGIC STUDY OF THE YAGUEZ RIVER WATERSHED,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W71-08971

CHEMICAL CHARACTERISTICS OF PRECIPITATION IN THE CHAMPLAIN VALLEY,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 02K.
W71-08973

PRECIPITATION, ITS CHEMICAL COMPOSITION AND EFFECT ON SOIL WATER IN A BEECH AND A SPRUCE FOREST IN SOUTH SWEDEN,
Lund Univ. (Sweden). Dept. of Plant Ecology.
For primary bibliographic entry see Field 02K.
W71-09081

CARBON MONOXIDE IN RAINWATER,
Naval Research Lab., Washington, D.C.
J. W. Swinnerton, R. A. Lamontagne, and V. J. Linnenbom.
Science, Vol 172, No 3986, p 943-945, May 28, 1971. 3 p, 1 tab, 11 ref.

Descriptors: *Gases, *Air environment, *Precipitation (Atmospheric), *Rain water, Atlantic Ocean, Pacific Ocean, Hawaii, Carbon dioxide, Methane, Organic matter, Vapor pressure, Pollutants.
Identifiers: *Geochemical cycle, *Carbon monoxide.

To help specify the various sources and sinks which play essential roles in the geochemical cycle involving carbon monoxide in the atmosphere, rainwater and air samples were collected for analysis at three locations--in Washington, D.C., over the Pacific Ocean, and on the island of Hawaii. Concentrations of carbon monoxide in rainwater collected at these widely diverse locations show up to 200-fold supersaturation relative to the partial pressure of the atmospheric gas. These results indicate existence of an additional natural source of carbon monoxide, probably the oceans, not heretofore considered. Production of this gas in clouds is tentatively attributed to photochemical oxidation of organic matter or the slight dissociation of carbon dioxide induced by electrical discharges, or both. Methane concentrations measured in the same rainwater show that partitioning of this gas, unlike that of carbon monoxide, is very close to a state of equilibrium. (Lang-USGS)
W71-09105

NUMBER AND SPACING OF RAINFALL-GAUGES IN A DECIDUOUS FOREST STAND,
Wroclaw Univ. (Poland). Inst. of Botany; and Polish Academy of Sciences, Bialystok. Mammals Research Inst.
Maciej S. Czarnowski, and Jerzy L. Olszewski.
Oikos, Vol 21, No 1, p 48-51, 1970. 4 p, 2 fig, 2 tab, 8 ref.

Descriptors: *Rain gages, *Forests, *Network design, *Data collections, *Instrumentation, Hydrologic data, Meteorological data, Regional analysis, Stations, Gaging stations, Rainfall.
Identifiers: *Poland.

The representative number of rainfall-gages for measuring rainfall under a forest canopy and the best spacing of these gages were determined. The experiment was made in 1963 in a deciduous stand in Bialowieza Primeval Forest (Poland). It is desirable to use at least 30 rainfall-gages, and measurement of rainfall does not, practically speaking, depend on the spacing of these gages when they are arranged in a regular network. (Knapp-USGS)
W71-09138

NIMBUS WEATHER SATELLITES: REMOTE SOUNDING OF THE ATMOSPHERE,
For primary bibliographic entry see Field 07B.
W71-09271

SOIL: A NATURAL SINK FOR CARBON MONOXIDE,
Stanford Research Inst., Irvine, Calif.
For primary bibliographic entry see Field 02G.
W71-09297

2C. Snow, Ice, and Frost

FIELD TESTS OF ICE PREVENTION TECHNIQUES,
Corps of Engineers, Anchorage, Alaska. Alaska District.
For primary bibliographic entry see Field 04A.
W71-08976

LONG-RANGE FORECASTING OF ICE BREAKUP ON RIVERS OF THE SEVERNYY KRAY (RUSSIAN: VSKRITIYE REK SEVERNOGO KRAYA I METODIKA YEGO DOLGOSROCHNOGO PROGNOZA),
T. N. Makarevich, N. A. Aniskina, Z. A. Yefimova, O. N. Potapova, and L. K. Savina.
In: Problems in Hydrological Forecasting (Voprosy gidrologicheskikh prognozov), Gosudarstvennyy Ordena Trudovogo Znameni Gidrologicheskiy Institut Trudy, No 179; Gidrometeoizdat, Leningrad, p 3-62, 1970. 60 p, 13 fig, 12 tab, 23 ref, 2 append.

Descriptors: *Ice breakup, *Forecasting, *Rivers, *Climatic data, Synoptic analysis, Air temperature, Water temperature, Air circulation, Meteorology, Seasonal, Heat balance.
Identifiers: *USSR, Severnyy Kray, Debacle, Ice cover.

A long-range forecast of ice breakup on rivers of the Severnyy Kray is based on analyzing the peculiarities of the spring regime of rivers and the character of the atmospheric processes which determine them. Breakup periods for rivers flowing in a northern direction are determined by the time of start and the discharge of spring high water at the upper reaches of the rivers. Ice breakup on rivers of the Severnyy Kray occurs in the period between April 20-30 and May 20-30, and generally lasts 35-40 days. Air pressure anomalies, October-March, March air temperatures in the Atlantic-European synoptic region, the Barents Sea temperature in March, and air temperatures at local stations during the last ten days of March are descriptive of the predominant macroprocesses responsible for ice breakup on rivers. The quantitative relationships derived satisfy requirements set forth by current forecasting instructions. (Josefson-USGS)
W71-09126

CALCULATING MAXIMUM ICE JAM LEVELS OF THE NEVA RIVER (RUSSIAN: RASCHET MAKSIMAL'NYKH ZAZHORNYKH UROVNEY R. NEVY),
R. A. Nezhikhovskiy, and G. V. Ardasheva.
In: Problems in Hydrological Forecasting (Voprosy gidrologicheskikh prognozov, Gosudarstvennyy Ordena Trudovogo Znameni Gidrologicheskiy Institut Trudy, No 179; Gidrometeoizdat, Leningrad, p 164-169, 1970. 6 p, 2 fig, 1 tab, 4 ref.

Descriptors: *Ice jams, *Rivers, *Water level fluctuations, *Flow profiles, Discharge (Water), Air temperature, Probability, Statistical methods, Forecasting.
Identifiers: *USSR, Lake Ladoga, Neva River.

The formation of ice jams on the Neva River depends upon water content of the river during freezing, amount of incoming ice from Lake Ladoga, and air temperature rate. Longitudinal profiles of the water surface are used to analyze fluctuations in the water level during ice jams. To calculate maximum ice jam levels of varying recurrence, empirical probability curves are constructed for a number of points at which long-term observations have been conducted (60-80 years). Probability curves of maximum ice jam levels are extrapolated into the region of rare recurrence. Graphs are constructed showing the change in equivalent values of maximum ice jam levels by river length (P—0.1; 1; 5; 20; 50%). The method used to compute maximum ice jam levels for the length of the Neva River can also be used for other rivers when ample observation points are available. (Josefson-USGS)
W71-09130

PERENNIAL ICE AND SNOW MASSES--A GUIDE FOR COMPILATION AND ASSEMBLAGE OF DATA FOR A WORLD INVENTORY.

UNESCO--IASH Contribution to International Hydrological Decade: UNESCO Technical Papers in Hydrology, No 1, 1970. 59 p, 26 fig, 9 tab, 5 ref.

Descriptors: *Snow surveys, *Glaciers, *Ice, *Data collections, *International Hydrological Decade, *Permafrost, Water yield, Regimen, Water resources development, Water resources, Runoff, Melt water, Standards, Stations, Snowpacks, Antarctic, Water balance, Heat balance, Snowmelt.
Identifiers: *Glacier surveys, *Snow and ice inventory.

Since about 80 percent of all fresh water exists in solid form, an accurate assessment of the amount, distribution and variation of all snow masses, both near and far from areas at present inhabited is of importance for the understanding of man's environment. To comply with the need for more complete and detailed informtion on ice and snow, the Co-ordinating Council of the IHD at its first session passed a resolution recommending to Member States the mapping and inventory of permanent snow and ice masses and the compilation and assemblage of data for publication in order to obtain the elements necessary for the establishment of the regional distribution of permanent and seasonal snow, permafrost and ice. Guidance and inventory methods are given for the compilation of a world inventory of perennial and seasonal ice and snow masses as a contribution to the estimation of the world water balance. (Knapp-USGS)
W71-09311

2D. Evaporation and Transpiration

ESTIMATING EVAPOTRANSPIRATION: AN EVALUATION OF TECHNIQUES,
Australian Water Resources Council, Camberra. Dept. of National Development.
C. S. Christian, R. O. Slatyer, C. E. Hounam, K. C. Leverington, and W. C. Swinbank.
Australian Water Resources Council Hydrological Series 5, 1970. 23 p, 49 ref.

Descriptors: *Evapotranspiration, *Energy budget, *Water balance, *Transpiration, *Hydrologic cycle, Water conservation, Saturated soils, Lysimeters, Irrigation effects, Microenvironment, Soil water movement, Evaporation, Moisture content, Water loss, Percolation, Underseepage, Infiltration, Wilting point, Forests, Soil properties.
Identifiers: Soil water storage.

This report reviews some of the experimental and theoretical procedures used in the evaluation and study of soil and plant evapotranspiration. It discusses the use of lysimeters of the soil-weighing type used in measuring evaporation rates. In this connection it is quite possible that weighing lysimeters can provide a more accurate measurement than the energy balance approach. However, their constant use under all conditions is somewhat restricted as the plant and soil community reproduced within the lysimeter pot must match very closely the plant and soil community being studies so as to obtain an accurate evaporation reading. This report further states that it is believed at present that the only suitable method for the measurement of evaporation from most land surfaces is that based on the evaluation of surface energy balance. Also included are specific mathematical formulas relating to catchment studies, energy balance approach, instrumentation, and estimation procedures. (Glasby-USGS)
W71-09312

2E. Streamflow and I..

HYDROLOGIC STUDY OF THE YAGUEZ RIVER WATERSHED,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W71-08971

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR NORTH CREEK, TRINITY RIVER BASIN, TEXAS - 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-09080

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA AND MUKEWATER CREEK, COLORADO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09083

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR CALAVERAS CREEK, SAN ANTONIO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09084

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1969,
Geological Survey, Austin, Tex., Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09086

RAINFALL-RUNOFF-HYDROGRAPH RELATIONS FOR NORTHERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02A.
W71-09087

A PROPOSED STREAMFLOW DATA PROGRAM FOR TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07A.
W71-09094

LOW-FLOW STUDY FOR SOUTHWEST OHIO STREAMS,
Geological Survey, Columbus, Ohio.
Earl E. Webber, and Ronald I. Mayo.
Geological Survey Open-file Report, May 1971. 14 p, 1 fig, 1 tab, 5 ref.

Descriptors: *Streamflow, *Low flow, *Discharge measurement, *Data collections, *Ohio, Hydrologic data, Flow rates, Stream gages, Gaging stations, Surface-groundwater relationships, Runoff, Base flow.
Identifiers: Little Miami River, Mill Creek, Great Miami River, Wabash River.

Low-flow discharges at 60 sites on streams in the Little Miami River, Mill Creek, Great Miami River and Wabash River basins in Ohio are presented. The average annual minimum flow in cubic feet per second for a 7-day period of 10-year frequency and a 1-day period of 30-year frequency are computed for each of the 60 sites. All of the gaging records for naturally-flowing streams and miscellaneous low-flow discharge measurements in southwest Ohio during the period 1914-70 were used. (Woodard-USGS)
W71-09097

AN ANCIENT HYDROGRAPHIC NETWORK ON THE KAMA, PECHORA AND VYCHEGDA INTERFLUVE (RUSSIAN: DREVNYAYA GIDROGRAFICHESKAYA SET' NA MEZHDU-RECH'YE KAMY, PECHORY I VYCHEGDY),
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Moscow (USSR).
I. V. Ryabkov.
Akademiya nauk SSSR Izvestiya, Seriya Geograficheskaya, no 1, p 100-108, Jan-Feb, 1971. 9 p, 4 fig, 4 ref.

Descriptors: *Geologic investigations, *History, Interfluves, *Rivers, Hydrography, Stratigraphy, Quaternary period, Canyons, Valleys, Pleistocene epoch, Geomorphology, Palynology, Terraces (Geological), Cross-sections.
Identifiers: *USSR, *Caspian Sea, Kama River, Pechora River, Vychegda River, Paleogeography, Quaternary deposits.

Drilling operations along the tributaries of the Kama and Vychegda Rivers show a deep valley referred to in literature as the 'Kel'tminskiy canyon.' A similar deepening was discovered in 1967 north of the canyon along the Vychegda and Pechora tributaries. Subsequent investigations to the east have uncovered ancient valleys along the Kama and Pechora tributaries. Subsequent investigations to the east have uncovered ancient valleys along the Kama and Pechora tributaries. The Kama, Pechora and Vychegda basin may be used to compare and correlate the stratigraphy of Quaternary deposits in the Caspian and Severnyy (boreal) basins. Reconstruction of the historical development of the basin's stream network is valuable for correlating the Pleistocene deposits filling the valleys for drafting local measures to divert runoff of northern rivers into the Caspian Sea. (Josefson-USGS)
W71-09102

HYDROLOGIC AND QUALITY CHARACTERISTICS OF THE LOWER MISSISSIPPI RIVER,
Geological Survey, Baton Rouge, La.
Jane E. Everett.
Louisiana Department of Public Works Technical Report No 5, 1971. 48 p, 34 fig, 3 plate, 4 tab, 8 ref.

Descriptors: *Mississippi River, *Louisiana, *Water quality, *Industrial wastes, *Water pollution, Water utilization, Sewage, Sediment load, Suspension, Colloids, Sediment transport, Industrial water, Chemical wastes, Pollutants, Waste disposal, Waste water disposal, Municipal wastes, Sewage treatment, Sewage effluents, Public health, River flow, Open channel flow, Flow rates.
Identifiers: New Orleans (La), Baton Rouge (La).

Maintaining the suitability of its water for municipal and industrial uses must be included in the proper utilization of the lower Mississippi River. The average daily flow of the Mississippi River at Vicksburg is 551,100 cfs, ranging from a high of 780,000 cfs on May 4, 1927, to a low of 100,000 cfs on October 17, 1939. Sediment concentrations at Red River Landing range from about 10 to 2,500 mg/l. The average annual suspended-sediment load is 450,000 tons per day, ranging from 288,000 tons per day in 1963 to 1,580,000 tons per day in 1951. Industrial demands for water from the Mississippi River have increased from 2.0 bgd in 1960 to 5.0 bgd in 1969; 95% of this water is returned to the river. Domestic sewage discharged into the Mississippi River causes high bacterial concentrations. In 1962 the coliform content exceeded 5,000 colonies per 100 milliliters about 13% of the time at the New Orleans Carrollton Street intake (mile 104) and about 35% of the time at the Algiers intake (mile 95). When the river is flowing at a rate of 600,000 cfs an accidental spill of 1,000 pounds of contaminant at Baton Rouge would have a peak concentration in New Orleans of 0.83 micrograms per liter 60 hours later. Under average flow conditions the rate of lateral dispersion of bank-injected contaminants would be about 250 feet per mile in straight reaches of the river. (Glasby-USGS)
W71-09103

BEHAVIOR OF POROUS BED NEAR FLOW SINGULARITY,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Straunanlagen and Wasserversorgung; and Georgia Inst. of Technology, Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 02G.
W71-09108

RECORDS OF PRECIPITATION, WATER LEVELS AND GROUNDWATER RECHARGE TO THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1970,
Geological Survey, San Antonio, Tex.
For primary bibliographic entry see Field 02F.
W71-09111

FLOOD PLAIN INFORMATION ON DAYS CREEK AND TRIBUTARIES AT TEXARKANA, ARKANSAS-TEXAS.
Corps of Engineers, New Orleans, La.
For primary bibliographic entry see Field 04A.
W71-09114

FLOOD PLAIN INFORMATION-CAPE FEAR RIVER AND CROSS CREEK WATERSHED, FAYETTEVILLE, NORTH CAROLINA.
Corps of Engineers, Wilmington, N.C.
For primary bibliographic entry see Field 04A.
W71-09115

REFINING THE CALCULATION AND FORECAST OF RAINFALL RUNOFF OF LARGE AND MEDIUM-SIZE RIVERS BY RUNOFF FROM SMALL BASINS, (RUSSIAN: UTOCHNENIYE METODA VYCHISLENIYA I PROGNOZA DOZHDEVOGO STOKA BOL'SHIKH I SREDNIKH REK PO STOKU S MALYKH BASSEYNOV),
N. N. Osadchaya.
In: Problems in Hydrological Forecasting (Voprosy gidrologicheskikh prognozov, Gosudarstvennyy Ordena Trudovogo Znameni Gidrologicheskiy Institut Trudy, No 179; Gidrometeoizdat, Leningrad, p 136-163, 1970. 28 p, 5 fig, 5 tab, 3 ref, 3 append.

Descriptors: *Runoff forecasting, *Runoff, *Rivers, *Watersheds (Basins), Inflow, Low flow, Precipitation (Atmospheric), Reservoirs.
Identifiers: *USSR, Ukraine, Dnieper River, Runoff plots.

The possibility of applying a method of forecasting runoff by dividing a basin into uniform plots and of using the method for making advance estimates of runoff for various-size rivers is examined. An average plot size of 2,500 sq km, previously used for a basin between the Dnieper River and the Kiev hydroelectric power plant, may be increased to 6,000 and even to as much as 8,000 sq km. A prediction of ten-day low flow 30 days in advance yields positive results only for large basins exceeding 100,000 sq km. Satisfactory predictions of low flow can be made 20 days in advance for basin areas 50,000-100,000 sq km and 10 days in advance for basins between 20,000 and 50,000 sq km. Generally it is possible to make a reliable prediction of minimum daily runoff 10 days in advance and in the case of large basins (100,000 sq km) 20 days in advance. A refining of the method of forecasting water flow to the reservoir of the Kiev power plant by increasing size of runoff plots and by reducing the number of plots used simplifies the work of preparing forecasts for reservoir operation. (Josefson-USGS)
W71-09127

CALCULATING RAINFALL RUNOFF LOSSES BY PRECIPITATION AND RUNOFF OF SMALL RIVERS USING THE DNIEPER RIVER-RECHITSA BASIN AS AN EXAMPLE (RUSSIAN: VYCHISLENIYE POTER' DOZHDEVOGO STOKA PO OSADKAM I STOKU MALYKH REK NA PRIMERE BASSEYNA R. DNEPRA DO G. RECHITSY),
T. I. Meyerson.
In: Problems in Hydrological Forecasting (Voprosy gidrologicheskikh prognozov), Gosudarstvennyy Ordena Trudovogo Znameni Gidrologicheskiy Institut Trudy, No 179; Gidrometeoizdat, Leningrad, p 117-135, 1970. 19 p, 3 fig, 4 tab, 10 ref, append.

Descriptors: *Rainfall-runoff relationships, *Precipitation (Atmospheric), *Runoff, *Rivers, *Inflow, Meteorological data, Time lag, Water loss, Streamflow forecasting.
Identifiers: *USSR, Dnieper River, Travel time.

A possibility of calculating rainfall losses of large rivers by the relationship of total runoff of small rivers to precipitation, termed the coefficient of inflow, is examined. In contrast to the runoff coefficient, defined as the ratio of runoff at a basin outlet to precipitation, the inflow coefficient is a more accurate description of losses, since it excludes the effect of transformations of inflow by large rivers. Runoff of the Dnieper River-Rechitsa basin is calculated from actual precipitation and from the inflow and runoff coefficients, which are determined from the relationships of each of the coefficients to antecedent basin conditions. Flow at the outlet of a large basin, computed by summarizing runoff derived from precipitation data of sub basins, yields better results than computing flow at the outlet of a large basin by application of precipitation data over the large basin. (Josefson-USGS)
W71-09128

A LONG-RANGE FORECAST OF WATER FLOW TO LARGE LAKES OF THE LADOGA BASIN (RUSSIAN: DOLGOSROCHNYY PROGNOZ PRITOKA VODY V KRUPNYYE OZERA LADOZHSKOGO BASSEYNA),
For primary bibliographic entry see Field 04B.
W71-09129

STUDY OF THE RELATIONSHIP BETWEEN ANNUAL RUNOFF OF RIVERS OF THE USSR AND ATMOSPHERIC CIRCULATION (RUSSIAN: ISSLEDOVANIYE ZAVISIMOSTI GODOVOGO STOKA REK SSSR OT ATMOSFERNOY TSIRKULYATSII),
For primary bibliographic entry see Field 02A.
W71-09136

DEPLETION OF STREAMFLOW BY INFILTRATION IN THE MAIN CHANNELS OF THE TUCSON BASIN, SOUTHEASTERN ARIZONA,
Geological Survey, Washington, D.C.
D. E. Burkham.
For sale by Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. Price $0.65. Geological Survey Water-Supply Paper 1939-B, 1970. 36 p, 11 fig, 1 plate, 7 tab, 1 ref.

Descriptors: *Ephemeral streams, *Streambeds, *Infiltration, *Streamflow, *Arizona, Channel morphology, Surface-groundwater relationships, Water yield, Rainfall-runoff relationships, Stream gages, Hydrologic data, Data collections, Mathematical studies, Hydrogeology, Aquifer characteristics, Groundwater recharge, Inflow, Duration curves.
Identifiers: *Tucson Basin (Ariz), Streamflow depletion, Infiltration rate.

Estimates were made of the average annual volume of infiltration for the period 1936-63 along seven normally dry alluvial channels in the Tucson basin of southeastern Arizona. The essential parts of the method used to estimate infiltration were (1) average relation between rates of inflow and infiltration and (2) flow-duration curves of streamflow. The main channels of the Tucson basin are efficient natural infiltration galleries. The average annual streamflow depletion ranged from about 30 to 90 percent of the average annual inflow to the seven reaches for the period 1936-63. The average an-

nual inflow to all the reaches was about 66,000 acre-feet; of this about 47,000 acre-feet, or 70 percent, was depleted by infiltration, and about 19,000 acre-feet flowed out of the basin. The annual variation in infiltration volumes along the main channels is large and is mainly the result of variation in streamflow. (Woodard-USGS)
W71-09139

GRAPHICAL CONVERSION OF A STAGE HYDROGRAPH TO A DISCHARGE HYDROGRAPH,
Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
Leonard F. Konikow.
Journal of Soil and Water Conservation, Vol 26, No 3, p 116-117, May-June 1971. 2 p, 2 fig, 1 tab, 2 ref.

Descriptors: *Stage-discharge relations, *Data processing, Data collections, Water levels, Discharge (Water), Streamflow, Gaging stations, Stream gages.
Identifiers: *Rating curves.

A rating curve is used to determine the discharge or extrapolate it for all recorded stream gages. The time spent converting stage to discharge may be shortened considerably by using a transparent overlay with a vertical scale of discharge values calculated from the rating curve. When the transparency is placed properly over a completed water-level recorder chart, the stage hydrograph becomes a discharge hydrograph. While this technique is particularly applicable to gaging stations with a stable stage-discharge relationship, a new overlay can easily be prepared if the rating curve shifts. The time and cost to do so is small. (Knapp-USGS)
W71-09275

THE OFFSET COURSE OF THE ST. JOHNS RIVER, FLORIDA,
North Carolina Univ., Chapel Hill.
For primary bibliographic entry see Field 02J.
W71-09309

A STUDY OF PRECIPITATION, STREAMFLOW, AND WATER USAGE ON THE UPPER RIO GRANDE,
Environmental Science Services Admin., El Paso, Tex.; and Bureau of Reclamation, El Paso, Tex.
For primary bibliographic entry see Field 02A.
W71-09310

ESTIMATING MEAN-ANNUAL RUNOFF USING CHANNEL EOMETRY MEASUREMENTS,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 04A.
W71-09313

A PROPOSED STREAMFLOW DATA PROGRAM FOR UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 07A.
W71-09332

PRELIMINARY REPORT ON WIND-TIDE FLOODING IN NEW HANOVER COUNTY, NORTH CAROLINA.
Corps of Engineers, Wilmington, N.C.
For primary bibliographic entry see Field 04A.
W71-09335

SPECIAL FLOOD HAZARD INFORMATION REPORT ON ECONLOCKHATCHEE RIVER, ORANGE AND SEMINOLE COUNTIES, FLORIDA.
Corps of Engineers, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W71-09339

RIVER RUNOFF - THEORY AND ANALYSIS,
D. L. Sokolovskii.
Available from the National Technical Information Service as TT70-50058, $3.00 in paper copy, $0.95 in microfiche. Jerusalem, Israel Program for Scientific Translations, 1971. 3d ed. 489 p.

Descriptors: *Stage-discharge relations, *Rainfall-runoff relationships, *Runoff forecasting, *Streamflow forecasting, *Water balance, Mathematical models, Hydrogeology, Water management (Applied), Systems analysis, Runoff, Streamflow, Lakes, Hydrology, Evapotranspiration, Statistical methods, Peak discharge, Low flow, Flood forecasting, Sediment discharge, Sediment transport, Silting, Computer programs.
Identifiers: *River runoff analysis.

This book, which deals with fundamentals of river runoff theory and with practical methods for computing characteristics of average annual runoff and its long-term distribution, seasonal distribution of runoff, maximum runoff of spring and rainfall floods, sediment discharge, and other characteristics of river hydrology, is intended for students studying hydrometeorology and geography. It may also serve as a theoretical and practical handbook for hydrological engineers, hydraulic engineers and other specialists dealing with the design and operation of water management structures. This edition differs from the first two editions (published in 1952 and 1959) by the inclusion of numerous changes and additions reflecting modern achievements in hydrology and requirements for hydrology and for runoff computations. Sections are included on the basic concepts of probability theory, determination of the long-term average groundwater flow of USSR rivers, methods for investigating patterns of annual runoff fluctuations, use of electronic analog computers in flood computations, the unit hydrograph method, hydrological and hydrometeorological computations in the design of irrigation systems, and methods for calculating maximum stages. (Knapp-USGS)
W71-90278

2F. Groundwater

DISPERSION IN HETEROGENEOUS NONUNIFORM ANISOTROPIC POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W71-09079

STUDIES OF INTER-PARTICLE VOID CHARACTERISTICS,
For primary bibliographic entry see Field 08D.
W71-09082

GEOLOGY AND GROUNDWATER RESOURCES OF TRAILL COUNTY: PART 3 GROUNDWATER RESOURCES,
Geological Survey, Bismark, N. Dak.
H. M. Jensen, and R. L. Klausing.
North Dakota Geological Survey Bulletin 49 and North Dakota Water Commission County Groundwater Studies 10, 1971. 40 p, 13 fig, 1 plate, 2 tab, 28 ref, append.

Descriptors: *Groundwater, *Water resources development, *Hydrologic data, *Aquifer characteristics, *North Dakota, Water wells, Hydrogeology, Water sources, Aquifers, Geology, Water table, Water levels, Water yield, Water level fluctuations, Water utilization, Water quality, Chemical analysis, Precipitation (Atmospheric), Data collections.
Identifiers: *Groundwater resources, *Traill County (N Dak).

Groundwater in Traill County is obtainable from sand and gravel deposits associated with the glacial drift of Pleistocene age and from sand and (or) sandstone beds in the Dakota Group of Late Cretaceous age. The principal aquifers are the Dakota, Hillsboro, Galesburg, Elk Valley, and Belmont aquifers. The Dakota aquifer, which is the largest and most productive aquifer in the county, yields more than a million gallons of highly mineralized water per day. The water may be either a sodium sulfate or sodium chloride type; however, sodium sulfate is the predominant water type. The dissolved-solids content of 29 samples of water ranged from 1,990 to 5,710 ppm and averaged 3,790 ppm. Sulfate content ranged from 355 to 3,220 ppm and averaged 1,320 ppm. The Hillsboro and Galesburg aquifers offer the most potential for future development. Individual well yields from the Hillsboro and Galesburg aquifers may be as much as 500 and 250 gallons per minute, respectively. Aquifers of less importance are present in the glacial drift, but they are relatively thin and of small areal extent. These aquifers yield adequate supplies of water for average domestic and livestock uses. (Woodard-USGS)
W71-09090

RESULTS OF A STUDY OF ORGANIC MATTER IN GROUNDWATERS OF KAMCHATKA (Russian: Rezul'taty izucheniya organicheskikh veshchestv v podzemnykh vodakh Kamchatki),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
For primary bibliographic entry see Field 02K.
W71-09099

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY: APPENDIX D - GEOLOGY AND GROUND WATER (FINAL DRAFT),
Geological Survey, Arlington, Va. and Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 03B.
W71-09106

RECORDS OF PRECIPITATION, WATER LEVELS AND GROUNDWATER RECHARGE TO THE EDWARDS AND ASSOCIATED LIMESTONES, SAN ANTONIO AREA, TEXAS, 1970,
Geological Survey, San Antonio, Tex.
Celso Puente.
Edwards Underground Water District Bulletin 27 (Texas), Apr 1971. 11 p, 4 tab, 12 ref.

Descriptors: *Groundwater, *Hydrogeology, *Aquifer characteristics, *Water levels, *Texas, Precipitation (Atmospheric), Groundwater recharge, Groundwater movement, Aquifers, Storage, Streamflow, Flow rates, Rainfall-runoff relationships, Surface-groundwater relationships, Water level fluctuations, Hydrologic data.
Identifiers: *Groundwater resources.

Records of precipitation, water levels, and estimates of recharge to the Edwards and associated limestones in the San Antonio, Texas area during 1970 are summarized. Rainfall for 1970 was below average throughout most of the recharge area. The water levels fluctuated just below the record high, owing to recharge from high flood runoff during intense storms. Groundwater storage in the Edwards Limestone remained above average during 1970. The estimated recharge was 661,600 acre-feet, which is about 30 percent above the average recharge for the period 1934-69. (Woodard-USGS)
W71-09111

HEAT TRANSFER MEASUREMENT IN A GEOTHERMAL AREA,
National Research Center for Disaster Prevention, Tokyo (Japan).
Kozo Yuhara.
Tectonophysics, Vol 10, No 1-3, p 19-30, 1970. 12 p, 7 fig, 4 tab, 8 ref.

Descriptors: *Geysers, *Heat flow, *Heat transfer, Mass transfer, Hot springs, Geothermal studies, Boiling, Convection, Cooling, Heat balance, Heat budget, Steam.
Identifiers: *Geothermal areas, *Japan.

In Japan, there are about twenty geothermal areas, where heat is transferred by fumaroles, steam wells, hot springs, steaming grounds, evaporation from hot pools and thermal conduction through the earth. Methods of heat transfer measurement used at Owakudani and Sounzan geothermal areas of Hakone Volcano are outlined. Total mass discharge from these areas amounts to 129 kg/sec and total heat transfer amounts to 10.64 million cal./sec. Heat transferred from all geothermal areas of Japan may be estimated roughly to be 2 times 10 to the 23rd power erg/year. Adding to this the energy released by volcanic activity, hot springs, and the normal heat flow of non-volcanic regions, the total energy released from the whole of Japan, exclusive of that by earthquakes is about 9 times 10 to the 24th power erg/year. (Knapp-USGS)
W71-09117

HEAT FLOW FROM NATURAL GEYSERS,
ESSA Research Labs., Boulder, Colo.; and Colorado Univ., Boulder. Dept. of Mechanical Engineering.
John Rinehart.
Tectonophysics, Vol 10, no 1-3, p 11-17, Sept 1970. 7 p, 5 fig, 7 ref.

Descriptors: *Geysers, *Heat flow, *Heat transfer, Mass transfer, Hot springs, Geothermal studies, Boiling, Convection, Cooling, Heat balance, Heat budget, Steam.
Identifiers: *Geothermal areas.

A natural geyser is a mechanism that extracts heat from the earth. Trapped meteoric water is heated and then thrown clear of its reservoir as hot water or steam, carrying heat with it. There are two basic types of geysers: Columnar, discharging quantities of hot water; and pool, in which the eruption consists of a series of detonating steam explosions. Results of temperature measurements made deep within several geysers permit calculation of their respective approximate rates of heat extraction. Old Faithful, which discharges large quantities of water, extracts heat at the approximate rate of 1.34 million cal./sec. Narcissus, an explosive type geyser, develops power at the approximate rate of 3 thousand cal./sec, and Solitary, another explosive geyser, at the rate of 6.4 thousand cal./sec. (Knapp-USGS)
W71-09118

GROUNDWATERS OF THE MANGYSHLAK-UST RT OIL-AND GAS-BEARING REGION (RUSIAN: PODZEMNYYE VODY MANGYSHLAKSTYURTSKOY NEFTEGAZONOSNOY ROVINTSII),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Gidrogologii i Gidrofiziki.
For primary bibliographic entry see Field 04B.
W71-09135

PRELIMINARY EVALUATION OF BANK TORAGE ASSOCIATED WITH LIBBY RESEROIR IN NORTHWESTERN MONTANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 03B.
W71-09137

ROUNDWATER DATA AS OF 1967--OLORADO DESERT SUBREGION, CALIFORIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09142

UMMARY OF THE GROUNDWATER DATA S OF 1967--CALIFORNIA REGION,
Geological Survey, Menlo Park, Calif. Water Resources Div.
S. Bader.
Geological Survey Open-file Report, July 24, 1969. p, 10 fig, 11 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Water table, Water levels, Reviews, Observation wells, Specific capacity, Withdrawal, Groundwater recharge, Water temperature, Water yield, Water quality, Chemical analysis, Dissolved solids, Aquifers.
Identifiers: *Groundwater data (Calif).

The groundwater data for the 11 hydrologic subregions of the California Region are summarized. Data for the observation wells include basin name, area of basin, depth to water in feet below land-surface datum, storage capacity, range of temperature, range of dissolved solids, and withdrawal capacity. Summaries for the Delta-Central Sierra Subregion, the Tulare Basin Subregion, and the San Joaquin Basin Subregion are combined. In addition to this report, the Geological Survey has prepared a series of nine reports for the 11 subregions. Each report contains data in a more complete form and an extensive list of publications by the U.S. Geological Survey and the California Department of Water Resources. (Woodard-USGS)
W71-09143

GROUNDWATER DATA AS OF 1967--NORTH COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09144

GROUNDWATER DATA AS OF 1967--SOUTH LAHONTAN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09145

GROUNDWATER DATA AS OF 1967--NORTH LAHONTAN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09146

GROUNDWATER DATA AS OF 1967--SAN JOAQUIN BASIN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09147

GROUNDWATER DATA AS OF 1967--SACRAMENTO BASIN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09148

WATER LEVELS IN CARBONATE ROCK TERRANES,
Geological Survey, Raleigh, N.C.; and Geological Survey, Washington, D.C. Water Resources Div.
Harry E. Le Grand, and V. T. Stringfield.
Ground Water, Vol 9, No 3, p 4-10, May-June 1971. 7 p, 3 fig, 16 ref.

Descriptors: *Water levels, *Hydrogeology, *Groundwater movement, *Water level fluctuations, *Karst, Limestones, Fissures (Geology), Permeability, Infiltration, Percolation, Water table, Topography, Climates, Springs, Water wells, Water yield, Water circulation, Carbonate rocks.
Identifiers: *Solution channels (Karst).

The depth to the water table in carbonate rocks is controlled by local factors such as permeability and topography and by the regional factor of climate; both permeability and topography are dynamically developed according to the degree of preferential circulation of subsurface water and of solution of the rock. The water table responds by lying deep beneath hilly permeable karstlands and shallow beneath flat and poorly permeable carbonate rocks. The uneven distribution of permeability and of topographic conditions is responsible for the karst phenomena of disappearing and reappearing surface streams. Great infiltration capacities of some karst regions result in large local fluctuations of the water table and in some cases in local reversals in direction of groundwater flow between wet and dry seasons. Water-level behavior in space and time is a primary consideration for interpreting the hydrology of carbonate terranes. (Knapp-USGS)
W71-09299

OBSERVATIONS ON WATER CONTENT CHANGES IN STRATIFIED SEDIMENTS DURING PIT RECHARGE,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 04B.
W71-09301

PHREATIC VERSUS VADOSE METEORIC DIAGENESIS OF LIMESTONES: EVIDENCE FROM A FOSSIL WATER TABLE,
Texas Univ., Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W71-09316

HYDRAULIC TESTING OF WELL HTH-23 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS-474-23 (AEC), (Central Nevada-32), June 1970. 34 p, 22 fig, 1 tab, 1 ref. USAEC Contract AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

An analysis is presented of data obtained during hydraulic tests in hydrologic test hole HTH-23, Little Smoky Valley, Nevada. The analysis focused primarily on determining transmissivity of selected intervals within the zone of interest. Further analysis is concerned with determining variations in hydraulic potential in the vertical section and transmissivity, hydraulic conductivity, storage coefficient, and velocity of groundwater movement. Hole HTH-23 penetrated alluvium, welded tuff, and tuffaceous sediments. The composite water level for the interval from 1,337.6 to 2,285.9 m was 138.8 m below land-surface datum. Transmissivity ranged from an estimated 0.00062 to 5.8 cubic meters per day per meter; hydraulic conductivity ranged from an estimated 0.0000084 to 0.15 cubic meters per day per square meter; and velocity was as high as 0.0045 meters per day. Velocities of groundwater movement through some intervals might be significantly greater. (See also W71-09325 thru W71-09331) (Knapp-USGS)
W71-09324

HYDRAULIC TESTING OF WELL HTH-4 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS-474-31 (AEC), (Central Nevada-34), June 1970. 21 p, 10 fig, 1 tab, 2 ref. USAEC Contract AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

An analysis is presented of data obtained during hydraulic tests in hydrologic test in hydrologic test hole NTH-4, Little Smoky Valley, Nevada. The

analysis is focused primarily on determining variations in hydraulic potential in the vertical section and transmissivity, hydraulic conductivity, storage coefficient, and velocity of groundwater movement. Hole HTH-4 penetrated alluvium, rhyolite, and welded tuff. The composite water level was 157.5 m below land-surface datum. Transmissivity ranged from an estimated 0.0073 to 7.3 cubic meters per day per meter; hydraulic conductivity ranged from an estimated 0.0008 to 0.8 cubic meters per day per square meter; and velocity ranged from an estimated 0.00032 to 0.019 meters per day. However, all of these values probably are low. During the cementing process, drilling mud and cement were forced into the water-bearing fractures and effectively sealed them from the borehole. (See also W71-09324) (Knapp-USGS)
W71-09325

HYDRAULIC TESTING OF WELL HTH-3 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS-474-34 (AEC), (Central Nevada-35), June 1970. 24 p, 12 fig, 1 tab, 2 ref. USAEC Contract AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

An analysis is presented of data obtained during hydraulic tests in hydrologic test hole NTH-3, Little Smoky Valley, Nevada. The analysis is focused primarily on determining variations in hydraulic potential in the vertical section and transmissivity, hydraulic conductivity, storage coefficient, and velocity of groundwater movement in selected intervals of anticipated high permeability. Hole HTH-3 penetrated alluvium, tuff, and tuffaceous sandstone and claystone. The composite water level for the interval from 1,431.6 to 1,831.5 m was 172.67 m below land-surface datum. In the tested intervals from which the data were adequate for analysis, transmissivity ranged from 0.97 to 2.9 cubic meters per day per meter; hydraulic conductivity ranged from 0.01 to 0.23 cubic meters per day per square meter; and velocity ranged from 0.002 to 0.046 meters per day. (See also W71-09324) (Knapp-USGS)
W71-09326

HYDRAULIC TESTING OF WELL HTH-5 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS-474-39 (AEC), (Central Nevada-37), June 1970. 15 p, 5 fig, 1 tab, 1 ref. USAEC Contract AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

An analysis is presented of data obtained during hydraulic tests in hydrologic test hole HTH-5, Hot Creek Valley, Nevada. Data collection was focused primarily on determining variations in hydraulic potential in the vertical section and permeability of the most transmissive intervals. Hole HTH-5 penetrated alluvium, tuffaceous sandstone and siltstone, and welded tuff with thin intervals of bedded tuff. The composite water level with the hole open from 635.2 to 1,830.8 m and with the casing perforated in two intervals from 173.7 to 179.8 m and from 536.4 to 551.7 m was 35.1 m below land-surface datum. In the tested intervals from which the data were adequate for analysis, static water levels ranged from 38.42 m below land-surface datum to 136.5 m above land-surface datum and relative specific capacities ranged from an estimated 0.00006 to 0.18 cubic meters per day per meter of drawdown. (See also W71-09324) (Knapp-USGS)
W71-09327

HYDRAULIC TESTING AND SAMPLING OF HOLE Ue-1, IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS 474-77 (AEC), (Central Nevada-7), June 1970. 25 p, 12 fig, 1 tab. USAEC Contract No AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

Hydraulic testing and sampling of hole Ue-1 for the U.S. Atomic Energy Commission's underground nuclear testing program in central Nevada began on January 31, 1967, and ended on February 13, 1967. Depth intervals tested and sampled were: zone 1, 1,710 feet to total depth; zone 2, 1,508 to 1,706 feet; zone 3, 1,266 to 1,464 feet; zone 4, 788 to 986 feet; and zone 5, 400 to 598 feet. Injection and recovery tests were run on each depth interval. Relative specific capacities calculated from injection data were much smaller than those calculated from recovery data. Mud and lost circulation material in the hole and in the formation during the injection test account for the different relative specific capacities. Comparative composite hydrostatic heads before and after the injection and recovery tests were 211.5 feet below land-surface datum and 218.0 feet below lsd. The difference may be due to differences in the conditions of the measurements. (See also W71-09324) (Knapp-USGS)
W71-09328

HYDRAULIC TESTING AND SAMPLING OF HOLE Ue-2, IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS-474-78 (AEC), (Central Nevada-8), June 1970. 23 p, 11 fig, 1 tab. USAEC Contract AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

Hydraulic testing and sampling of hole Ue-2 for the U.S. Atomic Energy Commission's underground nuclear testing program in central Nevada began on January 16, 1967, and ended on January 22, 1967. Seven depth intervals, beginning at 434 feet and extending to total depth, were tested and sampled. Injection tests were run on all depth intervals; recovery tests were run on intervals 2 through 7. In only one interval (zone 4) was the recovery-test curve suitable for determining relative specific capacity. In the zone, relative specific capacity calculated from recovery data was much less than that calculated from injection data. The composite hydrostatic head before and after injection and recovery tests was 579.6 feet below land-surface datum. In all zones where the static water level was measured after injection and then after swabbing (zones 3, 5, 6, and 7) the static water level changed after swabbing. (See also W71-09324) (Knapp-USGS)
W71-09329

HYDRAULIC TESTING AND SAMPLING OF HOLE Ue-3, IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS-474-79 (AEC), (Central Nevada-9), June 1970. 21 p, 11 fig. USAEC Contract AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igeneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

Hydraulic testing and sampling of hole Ue-3 for the U.S. Atomic Energy Commission's underground nuclear testing program in Central Nevada began on February 11, 1967, and ended on February 19, 1967. Depth intervals tested were: zone 1, 1,492 feet to total depth; zone 2, 1,310 to 1,488 feet; zone 3, 1,004 to 1,182 feet; zone 4, 865 to 1,043 feet; zone 5, 610 to 788 feet; and zone 6, surface to 400 feet. Permeability of zones 3, 4 and 5 is high whereas permeability of zone 1 is low. Mud in the borehole made a pretest determination of the composite hydrostatic head impossible. After testing, the static water level was 238.13 feet below land-surface datum. (See also W71-09324) (Knapp-USGS)
W71-09330

HYDRAULIC TESTING OF WELL HTH-21-1 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
George A. Dinwiddie.
Geological Survey Open-file Report USGS-474-81 (AEC), (Central Nevada-22), June 1970. 34 p, 23 fig, 1 tab, 1 ref. USAEC Contract AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifers, *Igneous rocks, *Nevada, Permeability, Groundwater movement, Porosity, Transmissivity, Velocity, Hydraulic conductivity, Storage coefficient, Water wells, Observation wells, Tracers, On-site tests.
Identifiers: Aquifer testing, Well testing, Pumping tests.

An analysis is presented of data obtained during hydraulic tests in hydrologic test hole HTH-21-1, Little Smoky Valley, Nevada. The analysis is focused primarily on determining transmissivity of selected intervals within the zone of interest. Further analysis is concerned with determining variations in hydraulic conductivity, storage coefficient, and velocity of groundwater movement in selected intervals of the entire hole. Hole HTH-21-1 penetrated alluvium, tuff, and tuffaceous sediments. The composite water level was 151.56 m below land-surface datum. In the tested intervals from which the data were adequate for analysis, transmissivity ranged from an estimated .000014 to 23.1 cubic meters per day per meter. (See also W71-09324) (Knapp-USGS)
W71-09331

FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.
Corps of Engineers, Buffalo, N. Y.
For primary bibliographic entry see Field 04A.
W71-09337

2G. Water in Soils

DISPERSION IN HETEROGENEOUS NONUNIFORM ANISOTROPIC POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 05B.
W71-09079

PRECIPITATION, ITS CHEMICAL COMPOSITION AND EFFECT ON SOIL WATER IN A BEECH AND A SPRUCE FOREST IN SOUTH SWEDEN,
Lund Univ. (Sweden). Dept. of Plant Ecology.
For primary bibliographic entry see Field 02K.
W71-09081

EHAVIOR OF POROUS BED NEAR FLOW INGULARITY,
arlsruhe Univ. (West Germany). Institut fuer ydromechanik, Straunanlagen and Wasserversorung; and Georgia Inst. of Technology, Atlanta. chool of Civil Engineering.
. S. Martin.
SCE Proceedings, Journal of the Soil Mechanics d Foundations Division, Vol 97, No SM-2, Paper 035, p 393-415, Feb 1971. 23 p, 16 fig, 6 tab, 10 f, 4 append. USN - Bur of Ships. Contract Nobs - 4237.

escriptors: *Flow resistance, *Beds, *Porous edia, *Soil mechanics, Fluid mechanics, Analyti- l techniques, Model studies, Theoretical analysis, nds, Seepage, Hydraulic gradient, Heaving, Flow tes, Boundaries (Surfaces), Flow separation, athematical studies.
entifiers: *Orthogonality, Boiling, Piping.

ne behavior of a porous bed in the vicinity of a w singularity that was imposed by the nonorthogonality of a potential line and a stream- e was studied theoretically and experimentally. ow of water under a circular cylinder that is par- lly imbedded in sand results in nonorthogonality the intersection of sand and cylinder unless the linder is half imbedded. The seepage force can theoretically infinite at the singular point. Ex- riments were conducted that led to boiling, heav- g, and piping for the partially-imbedded cylinder. sults of the experiment indicate that the flow sin- larity of nonorthogonality is not very serious cause nature apparently corrects for this anoma- by a readjustment of flow in the vicinity of the gularity. Furthmore, a more detailed investiga- n of the analytical solution in the vicinity of the gularity shows that, if the hydraulic gradient is aluated in terms of the sand diameter in the inity of singularity point, the seepage force may t actually be very large. (Woodard-USGS)
71-09108

OLUTES IN PRESSURE MEMBRANE FIL- ATES OF SEVERAL CLAY-WATER-ELEC- OLYTE SYSTEMS,
rth Carolina State Univ., Raleigh. Dept. of Soil ence.
nes Burton Hart Jr.
D Thesis, North Carolina State University, 70. 109 p, 13 fig, 24 tab, 106 ref. OWRR Project 008-NC (4).

scriptors: *Soil water movement, *Clays, *Soil ssure, *Water chemistry, *Diffusion, Ion change, Filtration, Model studies, Hydrogeology, alytical techniques, X-ray diffraction, Clay nerals, Chemical analysis, Soil water.
ntifiers: *Soils (Pressure filtration).

aluation is made of the composition of solutions ced out of clay suspensions by pressure dif- entials applied in a conventional pressure mem- ne apparatus and a standardized filtration hnique. Suspensions studied include Ca-satu- ed kaolinite and Na- and Ca-saturated mont- rillonite suspended in water or 0.1 N chloride s of the respective saturating cations. Specifi- y, the purpose was to determine the concentra- n of cations (Na or Ca) and anions (Cl) in fil- es extracted at various pressures, and the extent which the clay suspensions released other com- ents (including H, OH, Si, and Al species) dur- extraction. A series of clay-water-electrolyte pensions were prepared, characterized, and sub- ed to successive pressure increments. The fil- es were collected, analyzed, and evaluated with pect to solute composition and the chemical sta- y of the clays in the suspensions. The water ined by the clays decreased in the order Na- ntmorillonite, Ca-montmorillonite, and Ca- linite for the initial pressures and tended to rease to a common level at the final pressure. oodard-USGS)
1-09116

DEPLETION OF STREAMFLOW BY INFILTRATION IN THE MAIN CHANNELS OF THE TUCSON BASIN, SOUTHEASTERN ARIZONA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 02E.
W71-09139

CONSOLIDATION CHARACTERISTICS OF SOME PLEISTOCENE PERIGLACIAL METASTABLE SOILS OF EAST KENT,
Imperial Coll. of Science and Techology, London (England). Dept. of Geology.
Peter George Fookes, and Robert Best.
Quarterly Journal of Engineering Geology, Vol 2, No 2, p 103-127, Dec 15, 1969. 25 p, 12 fig, 2 tab, 30 ref.

Descriptors: *Loess, *Aeolian soils, *Soil stability, *Consolidation, Soil physical properties, Slope stability, Soil strength, Soil mechanics.
Identifiers: Kent (U.K.).

Metastable partially saturated soils are those which on wetting under load undergo a sudden decrease of void ratio and structural collapse. One of the most important soils of this group is loess, a silty quartzose sediment of uniform grading. This paper deals principally with the geotechnical and mineralogical characteristics of east Kent (U.K.) loess. A coarser grained poorly sorted glacial solifluxion soil from Kent was also examined and found to be metastable. Because material of this type is fairly common this observation could have significant engineering implications. (Knapp-USGS)
W71-09140

A MODEL STUDY OF THE SQUEEZING OUT OF INTERSTITIAL WATERS, (Russian: K voprosu ob izuchenii na modelyakh protsessa otzhatiya sedimentatsionnykh vod),
Institut Prirodnogo Gaza, Moscow (USSR).
V. L. Sokolov, and V. F. Simonenko.
Akademiya Nauk SSSR Izvestiya, Seriya Geologicheskaya, No 3, p 117-121, Mar 1971. 5 p, 1 fig, 19 ref.

Descriptors: *Model studies, *Connate water, *Geochemistry, *Hydrodynamics, Loads (Forces), Pressure, Compaction, Water properties, Clays, Diagenesis, Sediments, Lithification, Organic matter, Electrolytes.
Identifiers: *USSR, *Black Sea, Mineralization, Hydrocarbons, Geostatic pressure, Plastic flow.

The squeezing out of interstitial waters from sinking clay strata is a continuous process within a very wide range of depths, including the catagenetic zone. The process, which begins at the first stages of compaction and mineralization, parallels thermocatalytic transformation of organic matter by stimulating the initial migration of hydrocarbons. Black Sea muds were squeezed from 25 to 8,000 kg/sq cm, with a smoothly increasing load, for 38 days. The amount of squeezed-out interstitial water varies with compression rate at constant temperature and pressure. The remaining moisture after rapid compression is 9% and after slow compression, 2.8%. With rapid increases in load, some of the water cannot be squeezed out completely; the boundary of complete squeezing out of interstitial water from a sinking sediment may be quite deep. Assuming that the end of the squeezing out of interstitial waters takes place with a differential pressure of the order of 200 atm, the boundary of complete squeezing out of interstitial waters should be at a depth of about 4,000 m. (Josefson-USGS)
W71-09277

EFFECT OF CLAY ON THE ACCURACY OF THE HYDROMETER METHOD,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07B.
W71-09284

SOIL: A NATURAL SINK FOR CARBON MONOXIDE,
Stanford Research Inst., Irvine, Calif.
Robert E. Inman, Royal B. Ingersoll, and Elaine A. Levy.
Supported by Environmental Protection Agency and the Coordinating Research Council. Science, Vol 172, No 3989, p 1229-1231, June 18, 1971. 3 p, 2 fig, 11 ref.

Descriptors: *Soil physics, *Gases, *Air environment, *Soil microogranisms, *Air pollution, Fallout, Soil chemistry, Application method.
Identifiers: *Carbon monoxide, *Natural sinks (Gases).

The role of the soil as a natural sink into which carbon monoxide can readily disappear from the earth's atmosphere is described on the basis of measurements made on soil samples from California, Florida, and Hawaii. Most of the soils showed a surprising capability to remove CO from the test atmospheres. A plotting soil mixture depleted CO in a test atmosphere from a concentration of 120 ppm to near zero within 3 hours. Maximum activity occurred at 30 deg C. Steam sterilization of the soil, the addition or antibiotics or 10% (by weight) saline solution, and anaerobic conditions all prevented carbon monoxide intake. Sterilized soil inoculated with nonsterile soil acquired activity with time. Samples of various natural soils differed in their ability to remove CO from the air. Acidic soils with a high content of organic matter were the most active. Soil ability to remove CO from the atmosphere is ascribed to the activity of soil microorganisms. Average soil activity tested (8.44 mg of CO per hr per sq meter of soil) is equivalent to 191 metric tons per year sq mi, which is 6.5 times the annual estimated production of CO in the United States. The soil is thus a major natural sink for CO that is released into the air by nature or by the burning of fossil fuels. (Lang-USGS)
W71-09297

2H. Lakes

Lake Powell Quality Studies for the Navajo Plant,
Bechtel Inc., San Francisco, Calif; and Arizona State Univ., Tempe.
For primary bibliographic entry see Field 05C.
W71-09051

ISOLATION AND IDENTIFICATION OF STEROLS FROM A PLEISTOCENE SEDIMENT,
California Univ., Berkeley. Dept. of Chemistry.
William Henderson, Walter E. Reed, Gordon Steel, and Melvin Calvin.
Nature, Vol 231, No 5301, p 308-309, June 4, 1971. 2 p, 1 fig, 1 tab, 11 ref. Supported by NASA.

Descriptors: *Sedimentology, *Surface waters, *Sediments, *Dating, *Geologic time, Analytical techniques, Instrumentation, Gas chromatography, Spectrometers, Biological properties, California.
Identifiers: *Sterols, *Pleistocene sediment, Mono Lake.

Analysis of sediments for relatively unaltered molecules such as sterols which are present in sea water, bottom muds (both marine and non-marine), surface soils, and an Eocene shale is discussed. Sediments deposited in Mono Lake, California show no clearly freshwater fauna but contain an abundance of algal debris, diatoms, ostracods, and, locally, gastropods. The sediment analyzed contained alternate bands of algal silt and diatomite. It resides within a complete Pleistocene lacustrine sequence and its position within that sequence (that is, 80 m below the top of the Wilson Creek Formation, which is the latest Pleistocene sediment exposed in the Mono Basin) suggests an age about 130,000 yr. (Woodard-USGS)
W71-09095

EUTROPHICATION OF SHELTERED BAYS IN A LARGE LAKE,
Utah State Univ., Logan. Center for Water Resources Research.
For primary bibliographic entry see Field 05C.
W71-09150

A GUIDE TO AQUATIC SMARTWEEDS (POLYGONUM) OF THE UNITED STATES,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05G.
W71-09151

LIMNOLOGY OF LAKE CHAMPLAIN: 1965-1970,
Vermont Univ., Burlington. Dept. of Zoology.
E. B. Henson, and Milton Potash.
Available from the National Technical Information Service as PB-200 261, $3.00 in paper copy, $0.95 in microfiche. Vermont Water Resources Research Institute, Completion Report, Dec 1970. 23 p, 8 ref, 9 theses. OWRR Project A-001-VT (4).

Descriptors: *Limnology, *Lakes, *Eutrophication, Water pollution effects, Thermal properties, Chemical properties, Conductivity, Nutrients, Heavy metals, Zooplankton, Benthos, Periphyton, Amphipoda, Diptera, Snails, Mayflies, Midges, Mussels, Seston, Hydrology, Meteorology, Optical properties, Currents (Water), Vermont.
Identifiers: *Lake Champlain (Vt), Baseline information, Morphometry, Water budget, Cations.

This five year study assembled information on physical, chemical, and biological characteristics of Lake Champlain, Vermont, one of the largest and deepest lakes of the USA. The determinations included currents of the lake, water thermal and optical features, alkalinity, pH value, selected cations, dissolved oxygen, nitrates, phosphates, mercury, lead, phytoplankton, zooplankton, micro- and macro-benthos, colonization of shorelines, Polychaeta worms, and seston content. (Wilde-Wisconsin)
W71-09152

OXYGEN PRODUCTION IN SOME NORTHERN INDIANA LAKES,
Manchester Coll., North Manchester, Ind. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W71-09153

THE TENTH INTERNATIONAL MICROBIOLOGICAL CONGRESS, (In Russian),
E. N. Mishustin.
Izvestiya Akademii nauk SSSR, Ceriya Biologicheskaya, No 1, p 153-158, 1971.

Descriptors: *Microorganisms, *Foreign research, *Conferences, Water purification, Mexico, Sea water, Fresh water, Impoundments, Aquatic plants, Aquatic animals, Microbiology.
Identifiers: Tenth Microbiological Congress.

The 10th International Microbiological Congress held in Mexico City during August 9-15, 1970, was attended by more than 1,000 scientists from different parts of the world. The program embraced the general microbiology, taxonomy, genetics, agricultural microbiology, and technical microbiology. Special session was dedicated to microorganisms of seas and freshwater basins. In discussion of water-inhabiting saprophytic and autotrophic microorganisms attention was given to processes taking place in purification of water reservoirs. The participants decided to replace in the future the general congresses by meetings of narrower divisions, such as bacteriology, mycology, and virology. (Wilde-Wisconsin)
W71-09161

UTILIZATION OF HERBIVOROUS FISH IN FISH MANAGEMENT AND MELIORATION OF WATER BASINS, (IN RUSSIAN).
For primary bibliographic entry see Field 05G.
W71-09163

HYPNODINIUM-LIKE ALGAL BLOOMS IN GEORGIA LAKES,
Georgia State Univ., Atlanta. Dept. of Biology; and Georgia Water Quality Control Board, Atlanta.
For primary bibliographic entry see Field 05C.
W71-09173

PRODUCTION, MINERAL NUTRIENT ABSORPTION, AND BIOCHEMICAL ASSIMILATION BY JUSTICIA AMERICANA AND ALTERNANTHERA PHILOXEROIDES,
Auburn Univ., Ala. Agricultural Experiment Station.
For primary bibliographic entry see Field 05C.
W71-09178

A PLASTIC BARRIER FOR SPOT TREATMENT OF AQUATIC VEGETATION,
Texas Parks and Wildlife Dept., Waco.
For primary bibliographic entry see Field 05C.
W71-09179

PATHWAYS OF TRACE ELEMENTS IN ARCTIC LAKE ECOSYSTEMS. PROGRESS REPORT, APRIL 15, 1970-APRIL 14, 1971,
Alaska Univ., College. Inst. of Marine Sciences.
For primary bibliographic entry see Field 05C.
W71-09190

ASYMMETRY OF THE INTERNAL SEICHE IN LOCH NESS,
National Inst. of Oceanography, Wormley (England).
S. A. Thorpe.
Nature, Vol 231, No 5301, p 306-308, June 4, 1971. 3 p, 3 fig, 13 ref.

Descriptors: *Seiches, *Water circulation, *Surface waters, *Investigations, *Data collections, Analytical techniques, Water temperature, Winds, Water levels, Lakes, On-site investigations, Model studies.
Identifiers: *Loch Ness (Scotland), Asymmetry.

Loch Ness, Scotland seems to be particularly suitable for internal wave research. Because it is freshwater the effects of salinity, which are so difficult to monitor in the ocean, are absent. The dominant internal seiche has a wave-length twice the length of the Loch, and a marked asymmetry. Observations of the temperature structure of the Loch, using thermistors at ten levels at a station in Urquhart Bay were made from September 7 to October 12, 1970, and these confirm the asymmetrical shape of the seiche determined earlier. The asymmetry of the internal seiche of Loch Ness seems to be the result of a tendency for internal surges as a result of non-linear long wave effects. It is likely that the effect of the Earth's rotation is principally to cause a small alternating transverse tilt of the isotherms across the Loch during the seiching motion. (Woodard-USGS)
W71-09273

CHANGES IN THE CHEMICAL COMPOSITION OF SEDIMENTS OF LAKE WASHINGTON, 1958-1970,
Minnesota Univ., Minneapolis. Limnological Research Center; and Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W71-09281

NUMERICAL ESTIMATES OF ANCIENT WAVES, WATER DEPTH AND FETCH,
Florida State Univ., Tallahassee. Dept. of Geology.
For primary bibliographic entry see Field 02J.
W71-09288

LAKE ERIE: COMMON EFFORT CAN SAVE IT.
Bureau of Commercial Fisheries, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-09387

2I. Water in Plants

DARIAN PHYTOSOCIOLOGICAL DICTIONARY,
Battelle Memorial Inst., Columbus, Ohio.
J. A. Duke, and D. M. Porter.
Available from the National Technical Information Service as BMI-171-37, $3.00 in paper copy, $0.95 in microfiche. Report BMI-171-37, June 1, 1970. 70 p, 44 ref.

Descriptors: *Plant populations, *Nuclear explosions, *Canal construction, Canal design, Excavation, Panama canal, Rain forest, Systematics, Speciation, Ecology.

This compilation includes the following tables: diagrammatic portrayal of forest types of Darian, key to Darian forest types, zonal vegetation types along potential canal routes, attributes of some Darian localities. Phytosociological terms, which apply to Latin American vegetation types similar to those of Panama, are defined. The plants are described in appendixes. New species are included which were found during the canal survey. (See also W71-09006) (Bopp-ORNL)
W71-09010

PRECIPITATION, ITS CHEMICAL COMPOSITION AND EFFECT ON SOIL WATER IN A BEECH AND A SPRUCE FOREST IN SOUTH SWEDEN,
Lund Univ. (Sweden). Dept. of Plant Ecology.
For primary bibliographic entry see Field 02K.
W71-09081

RADIOECOLOGY OF CESIUM-137 AND STRONTIUM-90 IN A FOREST,
Institute of Public Health, Tokyo (Japan); Kiryu Coll. of Technology (Japan); and Japan Analytical Chemistry Research Inst., Tokyo.
For primary bibliographic entry see Field 05B.
W71-09241

2J. Erosion and Sedimentation

TRANSPORT OF SHOAL DEPOSITS,
Illinois Inst. of Tech., Chicago.
For primary bibliographic entry see Field 05G.
W71-08947

SEDIMENT, OUR GREATEST POLLUTANT,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05B
W71-09055

ISOLATION AND IDENTIFICATION OF STEROLS FROM A PLEISTOCENE SEDIMENT,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 02H.
W71-09095

PREDICTION OF IN-SITU ACOUSTIC AND ELASTIC PROPERTIES OF MARINE SEDIMENTS,
Naval Undersea Research and Development Center, San Diego, Calif.
Edwin L. Hamilton.
Geophysics, Vol 36, No 2, p 266-284, Apr 1971. 19 p, 3 fig, 7 tab, 69 ref, append.

Descriptors: *Bottom sediments, *Accoustics, *Mechanical properties, *Elasticity (Mechanical), Porosity, Shear strength, Velocity, Seismic studies, Sampling, Surveys, Geophysics, Density.
Identifiers: Acoustic properties (Sediments), Elastic properties (Sediments).

This is one of several interrelated reports concerning sound velocity, elasticity, and related properties of marine sediments from several major environments in the North Pacific and adjacent areas. This report is concerned with the correction of laboratory values to in-situ values, and the prediction of in-situ values in the absence of any sediment data. Although the samples and values are related to the North Pacific and adjacent areas, the methods and techniques of prediction are applicable to other areas and sediments. The keys to prediction of in-situ properties of marine sediments are knowledge of (1) general physiographic provinces and their associated sediments, (2) sedimentary processes within these environments, (3) laboratory or in-situ values of properties of the principal sediment types within the environments, and (4) methods of correcting laboratory values to in-situ values. Using measured values of density and compressional-wave velocity (corrected to in-situ values), plus a computed value of the bulk modulus, the other elastic constants can be computed; these include compressibility, rigidity (shear) modulus, Poisson's ratio, and velocity of shear waves. Numerical examples are given of all computations. (Knapp-USGS)
W71-09096

VARITATIONS IN DELTA S-34 IN SULFATES OF RECENT AND OLD SEA BASINS OF THE USSR (Russian: Variatsii del'ty S-34 v sul'fatakh ovremennykh i drevnikh morskikh vodoyemov ovetskogo Soyuza),
/sesoyuznyi Neftyanoi Nauchno-Issledovatelskii Geologorazvedochnyi Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02K.
W71-09098

PRELIMINARY INVESTIGATION OF THE URFICIAL SEDIMENTS IN THE CAP-BRETON CANYON (SOUTHWEST FRANCE) AND THE SURROUNDING CONTINENTAL HELF,
nstitut de Geologie du Bassin d'Aquitaine, Talence France).
eorge P. Allen, Patrice Castaing, and Andre lingebiel.
Marine Geology, Vol 10, No 5, p M27-M32, May 971. 6 p, 2 fig, 1 tab, 15 ref.

Descriptors: *Bottom sediments, *Glacial drift, Sampling, *Continental shelf, *Sedimentation, adioactive dating, Suspended load, Bed load, ilts, Clays, Sands, Sediment transport, Sedimenta- structures, Pleistocene epoch.
dentifiers: *Submarine canyons, *France, *Sedi-entary facies.

total of 120 grab samples of the surficial sedi-ents in the Cap-Breton, France, submarine anyon and surrounding continental shelf were col-cted and analyzed by grain-size sieving. A Q-ode Factor Analysis was made on the grain-size ata in order to define the most meaningful facies pes. Four distinct lithological facies were found exist: silt and clay, very fine sand, fine sand, and oarse sand. Comparison with previous work and a -14 date on the silt and clay facies showed that e facies are not contemporaneous. The sands and oarse sands on the shelf were emplaced during the re-Wurm and Wurm regressions, and later robably reworked during the Holocene (Flandri-n) transgression. The silty clays found in the anyon and on the shelf to the south are younger id represent sediments brought in as suspended ad by the Adour and other nearby rivers during e Holocene (Flandrian) transgression. (Knapp-SGS)
/71-09100

HOLOCENE SEDIMENTATION IN THE STRAIT OF OTRANTO BETWEEN THE ADRIATIC AND IONIAN SEAS (MEDITERRANEAN),
Technische Hochschule, Munich (West Germany). Institut fuer Geologie; and Technische Hochschule, Munich (West Germany). Dept. of Marine Geology and Sedimentalogy.
R. Hesse, U. Von Rad, and F. H. Fabricus.
Marine Geology, Vol 10, No 5, p 293-355, May 1971. 63 p, 23 fig, 78 ref, 3 append.

Descriptors: *Bottom sediments, *Sedimentary structures, *Stratigraphy, Continental shelf, Continental slope, Benthos, Geomorphology, Provenance, Sedimentation, Particle size, Mineralogy, Turbidity currents, Sediment transport.
Identifiers: *Mediterranean, *Adriatic Sea, *Ionian Sea.

An extensive radiograph study of 24 undisturbed, up to 206-cm long, box and gravity cores from the western part of the Strait of Otranto revealed a great variety of primary bedding structures and secondary burrowing features. The regional distribution of the sediments according to their structural, textural, and compositional properties reflects the major morphologic subdivisions of the strait into shelf, slope, and trough bottom. The terrigenous components of the surface sediments as well as those of the deeper sand layers can be derived from the Apulian shelf and the Italian mainland (Cretaceous Apulian Plateau and Gargano Mountains, southern Appenines, volcanic province of the Monte Vulture). Indicated by the heavy mineral glaucophane, a minor proportion of the sedimentary material is probably of Alpine origin. If this portion is considered to be first-cycle clastic material it recahes the Strait of Otranto after a longitudinal transport of 700 km via the Adriatic Sea. The lack of phyllosilicates in the coarse- to medium-grained shelf samples might be explained by the activity of the 'Apulian Current' (surface velocities up to 4 knots) which in the past possibly has affected the bottom almost down to depths of the shelf edge. The percentage of planktonic organisms, and also the plankton: benthos ratio in the sediments is a useful indicator for bathymetry (depth zonation). (Knapp-USGS)
W71-09101

CROSS-BEDDED TIDAL MEGARIPPLES FROM KING SOUND (NORTHWESTERN AUSTRALIA),
Bureau of Mineral Resources, Geology and Geophysics, Canberra (Australia).
For primary bibliographic entry see Field 08B.
W71-09122

SKEWNESS AS AN ENVIRONMENTAL INDICATOR IN THE SOLANI RIVER SYSTEM, ROORKEE (INDIA),
Oil and Natural Gas Commission, Ahmedabad (India).
A. K. Awasthi.
Sedimentary Geology, Vol 4, No 2, p 177-183, June 1970. 7 p, 2 fig, 1 tab, 10 ref.

Descriptors: *Particle size, *Alluvial channels, *Sediment transport, *Deposition (Sediments), *Sedimentation, *Statistical methods, Statistics, Frequency analysis, Distribution patterns, Bed load, Suspended load, Channel morphology, Meanders.
Identifiers: *India.

All of the grain-size parameters of terrigenous sediments, the sign of skewness is the most sensitive to environmental conditions of deposition. The sediments, skewed negatively at the river confluences and the upstream parts of meanders are indicative of turbulent energy conditions in the depositing medium. The positively skewed sediments at the downstream parts of meanders and the straighter parts of the river system, point to a calm and steady energy environment of sedimentation. However, the skewness value is not correlatable with the changes in the energy of the depositing medium. It is only the sign of skewness that indicates the state and the nature of the energy of the depositional agent. (Knapp-USGS)
W71-09123

SIGNIFICANCE OF PEBBLE SIZE AND SHAPE IN SORTING BY WAVES,
Nature Conservancy, Wareham (England). Furzebrook Research Station.
A. P. Carr, R. Gleason, and A. King.
Sedimentary Geology, Vol 4, No 2, p 89-101, June 1970. 13 p, 4 fig, 3 tab, 16 ref.

Descriptors: *Beaches, *Particle size, *Particle shape, *Waves (Water), *Sediment transport, Regression analysis, Sampling, Statistical methods, Erosion, Surf, Density, Bed load, Deposition (Sediments).
Identifiers: Sorting (Sediments), Grading (Sediments).

Means, standard deviations and standard errors are compared for length, breadth, thickness and weight of samples 500 quartzite and flint/chert pebbles from six beach crest sites on the shingle beach at Chesil Beach, Dorset, England. Because of the conditions prevailing, grading alongshore is especially well developed. The data are used in examining various shape ratios and indexes including LUTTIG's sigma and pi, the WENTWORTH-CAILLEUX flatness index, KRUMBEIN's sphericity index, and the maximum projection index of SNEED and FOLK. The only comparable dimension or index between the quartzite and flint/chert population is thickness. Since the specific gravity of both lithological types is the same it would appear that over the range of pebble sizes and shapes on this beach, thickness is the critical dimension in determining the overall sorting of pebbles by wave action. (Knapp-USGS)
W71-09124

DISTRIBUTION AND THICKNESS OF QUATERNARY SEDIMENTS IN THE LAKE CONSTANCE BASIN,
Heidelberg Univ. (West Germany). Sediment Research Lab.; and Dalhousie Univ., Halifax (Nova Scotia). Dept. of Geology.
German Muller, and Rudolf A. Gees.
Sedimentary Geology, Vol 4, No 1, p 81-87, Mar 1970. 7 p, 5 fig, 5 ref.

Descriptors: *Sedimentation, *Seismic studies, *Bottom sediments, *Lakes, *Distribution patterns, Glaciers, Geomorphology, Lake morphology, Lake basins, Lake beds, Topography, Surveys.
Identifiers: *Lake Constance (Germany).

Distribution and thickness of Pleistocene and Holocene sediments are derived from a continuous seismic reflection survey of the Lake Constance Basin. The sediment distribution within the lake confirms the concept that the Lake Constance Basin has been formed by glacial erosion rather than by structural deformation. (Knapp-USGS)
W71-09125

COASTAL REGIME - RECENT U. S. EXPERIENCE,
Corps of Engineers, Washington, D.C. Coastal Engineering Research Center.
For primary bibliographic entry see Field 08B.
W71-09141

RIVER BED DEGRADATION,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 08B.
W71-09149

LONGITUDINAL DUNES OF THE NORTHWESTERN EDGE OF THE SIMPSON DESERT, NORTHERN TERRITORY, AUS-

TRALIA, 1. GEOMORPHOLOGY AND GRAIN SIZE RELATIONSHIPS,
Texas Univ., Austin, Dept. of Geological Sciences.
Robert L. Folk.
Sedimentology, Vol 16, No 1-2, p 5-54, Mar 1971. 50 p, 16 fig, 1 tab, 183 ref.

Descriptors: *Dunes, *Deserts, *Sediment transport, *Aeolian soils, *Particle size, Sedimentary structures, Wind erosion, Statistical methods.
Identifiers: *Sorting (Sediments), *Simpson Desert (Australia).

Origin of the longitudinal dune form is reviewed. The spectacular longitudinal dunes of the Simpson desert are caused by helicoidal wind flow of the prevailing south-southeastern winds, acting upon ancient alluvial plains. Critical in this theory is the evidence from 'tuning-fork' dune junctures, which open upwind as do similar features in other geologic realms of primarily one-directional currents undergoing second-order helicoidal circulation. Review of previous work on using grain size to distinguish beach from dune sands reveals the consistent good sorting and positive skewness of coastal dunes. Simpson desert dunes are also positively-skewed, but are not as well sorted as coastal dunes because they are only recently derived from poorly-sorted alluvial source sediments. Dune crests are coarsest and best sorted because they are made out of the most easily saltated fine sand (about 2.5 ph); windward flanks, leeward flanks, and reg are progressively finer and also show regular and explainable changes in the higher-order grain-size parameters. Both dune and reg sediments are polymodal mixtures, giving rise to a 'quantum theory' of aeolian deposition. (Knapp-USGS)
W71-09279

TURBIDITIES OF THE NORTHEAST PACIFIC,
Lamony-Doherty Geological Observatory, Palisades, N.Y.
D. R. Horn, M. Ewing, M. N. Delach, and B. M. Horn.
Sedimentology, Vol 16, No 1-2, p 55-69, Mar 1971. 15 p, 5 fig, 1 tab, 40 ref. Naval Ship Systems Command Contract N00024-67-C-1184; ONR Contract N00014-67-A-0108-0004; NSF Grant NSF-GA-1193.

Descriptors: *Bottom sediments, *Turbidity currents, *Sediment transport, *Pacific Ocean, Sands, Continental slope, Density currents, Suspended load, Bed load, Particle size, Sedimentary structures, Deposition (Sediments), Silts, Clays.
Identifiers: Grading (Sediments).

The northeast corner of the Pacific Ocean is a region of turbidity-current activity. Cores from this area are dominated by very fine-grained sand and medium-grained silt that grade upward to clay. This paper is based on 217 textural analyses of turbidite layers comprising 30 piston cores. It is possible to distinguish proximal and distal facies of turbidites using characteristics of layering, grading and texture. Features of the proximal facies include wide range of layer thickness, maximum layer thickness, non-grading, truncation of grading, textural reversals, and sand at the base of graded layers. Areas beyond main routes of submarine flows are sites of episodic addition of silt-through clay-sized sediment. The proportion, thickness, and mean grain size of the silt decreases with increasing distance from the main avenues of flow. (Knapp-USGS)
W71-09280

A COARSE-GRAINED POCKET BEACH COMPLEX, TANAFJORD (NORWAY),
Oxford Univ. (England). Dept. of Geology and Mineralogy.
D. K. Hobday, and N. L. Banks.
Sedimentology, Vol 16, No 1-2, p 129-134, March 1971. 5 p, 5 fig, 2 ref.

Descriptors: *Beaches, *Particle size, *Particle shape, *Gravels, *Sediment transport, Surf, Sedimentation, Shores, Sedimentary structures.
Identifiers: *Pocket beaches, *Norway, Sorting.

The bulk of the material of the pocket beach at the mouth of the Manndraperely, Tanafjord, northern Norway, is supplied by the river. The stream bed consists of poorly sorted coarse sediments which show a crude upstream imbrication. Dampening of wave activity near the mouth of the stream by the outflow of water caused relatively fine-grained material to accumulate on spits. Size-shape sorting by waves concentrates the finest pebbles on landward moving swash bars. Away from the stream mouth beach deposits become finer grained landward, and are zoned in a manner that might be confused with coarse-grained fluviatile sequences. Study of the textures of the Manndrapereiv deposits establishes criteria for distinguishing between these two possibilities. (Knapp-USGS)
W71-09282

BREAK OF SLOPE IN PARTICLE-SIZE CURVES OF GLACIAL TILLS,
Durhan Univ. (England). Dept. of Geography.
Peter Beaumont.
Sedimentology, Vol 16, No 1-2, p 125-128, March 1971. 4 p, 1 fig, 1 tab, 1 ref.

Descriptors: *Particle size, *Glacial drift, *Till, *Sieve analysis, *Sands, Gravels, Frequency analysis, Statistical methods, Distribution patterns, Provenance.
Identifiers: *Particle size analysis, *England.

In studies of particle-size distribution of the less than 20-mm fraction of glacial clays in eastern Durham, England, one particular characteristic seems common to them all; when the particle-size data obtained by sieving and hydrometer analysis are plotted on semi-logarithmic graph paper almost all the curves are made up of two shallow concave or straight sections separated by a small section of varying convexity. This convexity or marked break of slope is nearly always found in the range 0.2-0.8 mm. The break of slope shows that the material in the finer grain sizes is more abundant than the coarser material, and that there is a change in the nature of the sediment from a dominance of rock fragments to one of mineral grains. Therefore, the break of slope is obviously related to local parent material, and probably reflects the wearing effect of the ice on the rock frament included within it. In different areas it would seem likely that this break of slope in the particle-size curve of glacial tills would take place at different grain sizes and be a reflection of the dominant particle-size distribution of the parent material over which the ice was moving. In this case Carboniferous sandstones are considered to be the main parent material of the till sheet. (Knapp-USGS)
W71-09283

EFFECT OF CLAY ON THE ACCURACY OF THE HYDROMETER METHOD,
Indian Inst. of Tech., Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07B.
W71-09284

CORRELATION OF SEDIMENT CORES ON THE BASIS OF THEIR MAGNETIZATION,
Bundesanstalt fuer Bodenforschung, Hanover (West Germany).
Dietrich Heye.
Sedimentology, Vol 16, No 1-2, p 111-117, March 1971. 7 p, 6 fig, 5 ref.

Descriptors: *Bottom sediments, *Magnetic studies, *Cores, Sampling, Atlantic Ocean, Sedimentology, Sedimentation, Stratigraphy, Indian Ocean.
Identifiers: Magnetization (Sediments).

Sediment cores originating from the Indian and the Atlantic Ocean were investigated. The declination of the cores was measured non-destructively. In both regions it was possible to correlate several cores on the basis of their magnetization (intensity correlation in contrast to correlation of paleomagnetic reversals). Additional layers of turbidity-currents and a layer of volcanic material were detected. (Knapp-USGS)
W71-09285

SLUMPING ON A CONTINENTAL SLOPE INCLINED AT 1-4 DEGREES,
New Zealand Oceanographic Inst., Wellington. Dept. of Scientific and Industrial Research; and Victoria Univ., Wellington (New Zealand). Dept. of Geology.
K. B. Lewis.
Sedimentology, Vol 16, No 1-2, p 97-110, March 1971. 4 p, 4 fig, 1 tab, 35 ref.

Descriptors: *Landslides, *Continental slope, *Sedimentation, Turbidity currents, Mud, Sedimentary structures, Bottom sediments.
Identifiers: *Slumping.

Continuous seismic profiles from the upper continental slope east of North Island, New Zealand, show that surface sediment 10-50 m thick has slumped down bedding planes sloping at 1-4 deg. There are four slumps, the Kidnappers Slump which has an area of 250 sq km, the Paoanui Slump of 80 sq km, a small slump of only several square kilometers and a slump of undetermined extent. All occurred during the last 20,000 years in Last Glacial Age sediments. A glide plane is exposed at the head of each slump and beds are thrust or contorted at the toe of some slumps. Slumping was probably caused by the failure of loosely packed sandy silt during major earthquakes. (Knapp-USGS)
W71-09286

MICRITIC ENVELOPES OF CARBONATE GRAINS ARE NOT EXCLUSIVELY OF PHOTOSYNTHETIC ALGAL ORIGIN,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology; State Univ. of New York, Stony Brook. Dept. of Earth and Space Sciences; and Barnard College, New York. Dept. of Geology.
Gerald M. Friedman, Conrad D. Gebelein, and John E. Sanders.
Sedimentology, Vol 16, No 1-2, p 89-96, March 1971. 7 p, 27 ref.

Descriptors: *Carbonate rocks, *Sedimentary structures, *Algae, *Paleohydrology, *Sedimentation, Sedimentology, Stratigraphy, Limestones, Marl, Chemical precipitation, Deposition (Sediments), Biochemistry.
Identifiers: *Micrite.

Micritic envelopes are commonly believed to develop from the lime-mud infillings of circumferential perforations made in skeletal particles by algae. Because 'algae' are usually taken to mean photosynthetic algae, it has been proposed that micritic envelopes would not appear on carbonate skeletal particles originating in waters too deep for active growth of photosynthetic algae. This depth limiting concept of the origin of micritic envelopes is challenged for two reasons: (1) petrographic study of a large number of thin sections thought to be representative of various paleo-depth levels does not indicate any systematic variations in the preservation of the outlines of skeletal particles and (2) molluscan skeletal debris displaying micritic envelopes and effects of borings identical with those generally ascribed to the activities of photosynthetic algae were found in an aragonite cemented sandstone from the Atlantic shelf where geologic evidence indicates that the water at time of boring was too deep for active growth of photosynthetic algae. Organisms other than photosynthetic algae can bore into calcareous materials. In particular, fungi, bacteria, and heterotrophic algae (whose distribution does not depend on the penetration of light into seawater) are known to be active borers. (Knapp-USGS)
W71-09287

NUMERICAL ESTIMATES OF ANCIENT WAVES, WATER DEPTH AND FETCH,
Florida State Univ., Tallahassee. Dept. of Geology.
William F. Tanner.
Sedimentology, Vol 16, No 1-2, p 71-88, March 1971. 8 p, 1 fig, 4 tab, 11 ref.

escriptors: *Sedimentary structures, *Ripple arks, *Particle size, *Waves (Water), *Regression analysis, Currents (Water), Paleohydrology, ceanography, Lakes.
dentifiers: *Sorting (Sediments).

series of carefully controlled marine experients, in which sand of known grain diameter and ssentially perfect sorting was exposed to waves of arious sizes, was supplemented by study of lakes various widths (and hence differing values for tch), in an effort to obtain relationships between arameters measurable in sedimentary rocks (i.e., pple-mark spacing) and paleogeographic infor-ation (water depth, wave height, wave length, d fetch). Regression equations were obtained, lating ripple-mark spacing to grain size, water ave-length, water depth, and water wave-height. general those based on water wave-length were perior to those based on water wave-height. In allow water, the values which can be obtained om these equations are highly limited in range, d thus define the palegeographic unknowns asonably closely. These values can be inserted to three additional equations, which relate fetch various wave parameters. (Knapp-USGS)
71-09288

EOLOGICAL OBSERVATIONS OF THE IAMI TERRACE FROM THE SUBMERSIBLE EN FRANKLIN,
oods Hole Oceanographic Institution, Mass.
obert D. Ballard, and Elazar Uchupi.
arine Technology Society Journal, Vol 5, No 2, p -48, March-April 1971. 6 p, 4 fig, 1 tab, 10 ref. NR Contract 3484; USGS Contract 12109.

escriptors: *Continental shelf, *Surveys, ampling, *Submarines, Oceanography, thymetry, Sounding, Seismic studies, Profiles, orida, Underwater, Topography, Sedimentary uctures, Geomorphology, Stratigraphy, Currents Water), Mineralogy, Atlantic Ocean.
entifiers: Miami terrace (Fla).

bservations made from the submersible Ben anklin were used to complement earlier instigations of the Miami Terrace. The terrace is vided into four geomorphic provinces: a ocene-Quarternary wedge of prograding sedients, a central irregular platform covered by a ntinuous pavement of phosphorite, an outer terce ridge province also covered with phosphorite, d an outer terrace slope composed of sediments d large phosphorite covered talus blocks. Visual servations, bottom samples, and current meaements made in each of these four provinces by submersible were compared with previously obned results based upon the conventional chniques of seismic profiling, echo-sounding, and ttom photography. (Knapp-USGS)
71-09290

EASUREMENTS OF THE ENGINEERING OPERTIES OF MARINE SEDIMENTS,
val Academy, Annapolis, Md. Dept. of Ocean gineering.
T. Monney.
arine Technology Society Journal, Vol 5, No 2, p -30, March-April 1971. 10 p, 41 ref.

scriptors: *Bottom sediments, *Shear strength, strumentation, *Mechanical properties, *On-e testing, Coastal engineering, Civil engineering, gineering geology, Foundation investigations.
ntifiers: Marine sediments.

truments currently used to measure engineering operties of marine sediments in situ are evaluated h respect to actual performance and required curacies. The inherent difficulties of measuring se properties in the laboratory rather than in situ reviewed, and test results are provided which icate existing sampling devices and procedures oduce questionable results. Measurement of ar strength of sediments is of particular interest ngineers, and development of an in situ direct ar device is recommended. A bore-hole direct-shear device which measures the internal angle of friction and cohesion from inside bored holes is under development. The device is a split cylinder with horizontal knife edges which is hydraulically loaded within a bore hole in a radial direction. When the sediment is consolidated under an increment of load the cylinder is pulled until shear failure occurs. Additional loads and pulls provide a measure of shear strength under increasing normal stress. Tests on sand, loam, silt and clay demonstrate close agreement between in situ tests and laboratory triaxial and direct shear tests. With modifications it should be feasible to utilize the device for measuring the shear strength of marine sediments. (Knapp-USGS)
W71-09291

INTERAGENCY APPROACH TO WATERSHED PROBLEMS OF EEL RIVER,
California State Dept. of Water Resources, Red Bluff. Northern District.
Eugene F. Serr.
Proceedings of the American Society of Civil Engineers, Journal of the Irrigation and Drainage Division, Vol 97, No IR-1, Paper 7983, p 181-192, March 1971. 12 p, 2 fig, 2 tab, 8 ref.

Descriptors: *Sediment yield, *California, *Erosion, *Suspended load, Provenance, Landslides, Stream erosion, Gully erosion, Sediment control, Erosion control, Water quality control.
Identifiers: *Eel River (Calif).

Watershed studies in the Eel River basin, California, are summarized. The U. S. Geological Survey estimated the long-term average suspended sediment load near the mouth at 7,400 tons per sq mile of drainage area. Among larger rivers of the world, this figure is known to be exceeded only by the Yellow River of China and certain of its tributaries, and the Semani River in Albania. The U. S. Soil Conservation Service found that the principal sediment sources in the basin were streambank erosion (54%), landslides (26%), and sheet and gully erosion (10%). The maximum feasible sediment reduction through land treatment measures was estimated at about 20%. Active and intensive watershed management can be expected in the future in problem areas in the Eel River basin as measures such as cover manipulation become economically feasible and more is learned about wildland water quality and quantity control. (Knapp-USGS)
W71-09292

NET KINETIC ENERGY IN LITTORAL TRANSPORT,
Florida State Univ., Tallahassee. Dept. of Geology.
William F. Tanner.
Science, Vol 172, No 3989, p 1231-1232, June 18, 1971. 2 p, 5 ref.

Descriptors: *Kinetics, *Sediment transport, *Littoral drift, *Beach erosion, Coastal engineering, Shore protection, Soil management, Gulf of Mexico, Florida.
Identifiers: *Net Kinetic energy, *Littoral transport, Coastal management.

Studies of coastal erosion and coastal management are discussed. Studies can be put on a firm physical basis after methods are developed for closely estimating the energy expended in actual unidirectional net littoral transport of sediment. Such measures have been obtained for six coastal drift cells. The results, for a 68-year period, vary from a minimum of 0.6 X 10 to the 4th power ergs (very low energy) to a maximum of 340 X 10 to the 4th power ergs (moderately high energy) per cell. Data are analyzed for the Gulf of Mexico southwest of Tallahassee, Florida, and include the mass volume of sand moved, the distance moved, and the time interval covered. (Lang-USGS)
W71-09298

THE SEDIMENT ON THE FLOOR OF THE SOUTHERN IRISH SEA,
University Coll. of Wales, Aberystwyth. Dept. of Geology.
M. R. Dobson, W. E. Evans, and K. H. James.
Marine Geology, Vol 11, No 1, p 27-69, June 1971. 43 p, 10 fig, 74 ref, append.

Descriptors: *Bottom sediments, *Tidal effects, *Sediment transport, *Sand waves, *Currents (Water), Sampling, Data collections, Deposition (Sediments), Sedimentary structures, Ripple marks, Sands, Carbonates, Particle size, Provenance, Tides, Water circulation.
Identifiers: *Irish Sea.

The southern Irish Sea was surveyed using Asdic, continuous reflexion profiling, echo sounding, and bottom samples. The results are presented in the form of a sediment facies chart. Some of the major sea-bed features were interpreted using seismic data. Bed forms, principally sand waves, sand ribbons and sand streams, were identified and their hierarchical associations established; these have provided insight into the patterns of sediment circulation. The form of these patterns is directly under the control of the tidal regime (which, in the southern Irish Sea, is the reverse of that normally found around British coasts). Along the Irish coast the tidal form consists of high velocities associated with negligible range: on the Welsh side low velocities and a pronounced range are the usual association. The effects of these tidal peculiarities on the sediment are to create a bedload separation on the Irish shelf, and a coalescence on the Welsh side. The sub-littoral sands are essentially quartzose with a strongrock debris component, carbonate contents being generally low (5%). Offshore and in mid-channel, there is a variable carbonate component which is bidmodal as a result of whole shell imposition. Macrofauna communities, broadly defined in association with bottom characteristics, illustrate relationships between source material and detrital organogenic sediment. (Knapp-USGS)
W71-09305

DIFFERENTIAL EROSION OF CARBONATE-ROCK TERRANES,
Geological Survey, Raleigh, N.C.; and Geological Survey, Washington, D.C.
H. E. Le Grand, and V. T. Stringfield.
Southeastern Geology, Vol 13, No 1, p 1-17, May 1971. 17 p, 3 fig, 28 ref.

Descriptors: *Geomorphology, *Erosion, *Carbonate rocks, *Karst, *Limestones, Weathering, Leaching, Topography, Water chemistry, Residual soils, Soil water, Soil formation, Vegetable effects, Groundwater.
Identifiers: *Karst topography, *Carbonate-rock topography.

Relief in carbonate-rock terranes may be local and small as expressed by many shallow sinkholes, or large as expressed by poljes and escarpments. In addition to relief within the karst terrane, there is commonly significant relief between a belt of carbonate rocks and an adjacent belt of noncarbonate rocks. Erosion in carbonate terranes is favorable under moderate rather than under extreme conditions of cover, purity of the carbonate rock, topographic relief, and precipitation. Denuded carbonate rocks are much more resistant to physical and chemical erosion than are carbonate rocks with a moderately thin soil and vegetal cover; where the soil and rock cover is very thick, physical erosion of the covered bed is impossible and chemical erosion may be retarded because of retarded water circulation. Pure carbonate rocks yield no insoluble residue to form a cover; also, intense precipitation tends to strip off a thin cover and to keep the rock denuded. If the carbonate rocks are relatively impermeable, water cannot easily penetrate rock to aid soil development. Thus, the degree of cover on a carbonate terrane is an important key to differential erosion and to much of the topographic relief. (Knapp-USGS)
W71-09307

LITHOLOGY OF ROCKS DREDGED FROM THE BLAKE PLATEAU,
Virginia Polytechnic Inst., Blacksburg. Dept. of Geological Sciences.
Richard M. Pratt.
Southeastern Geology, Vol 13, No 1, p 19-38, May 1971. 20 p, 6 fig, 44 ref.

Descriptors: *Bottom sediments, *Continental slope, *Sampling, Surveys, Carbonates, Phosphates, Manganese, Chemical precipitation, Deposition (Sediments), Sedimentation, Sediment transport, Florida, Atlantic Ocean, Currents (Water), Water circulation.
Identifiers: *Gulf Stream, *Blake Plateau.

Dredge samples and photographs from the Blake Plateau, off the southeastern coast of the United States, were used to study the bottom material, which has both a sediment component and a rock component. Sediment is characteristically very well sorted foraminiferal sand except near the Bahama Banks where it is carbonate lutite. The rock fraction can conveniently be separated into limestone, coral, phosphate concretions and manganese concretions. Coral is most abundant beneath the axis of the Gulf Stream and owes its growth to a long-term equilibrium condition between sedimentation and erosion maintained by the currents. The coral helps to stabilize the bottom by trapping fine sediment. Phosphate nodules occur extensively from the slope to the other escarptment across the northern end of the Plateau, and in a small area off Miami, Florida. Manganese concretions are forming under present day conditions. The manganese concretions grow by replacement of phosphate nodules as well as by simple accretion. Their overall chemical composition is similar to that of deep-sea deposits. The Gulf Stream is the controlling environmental factor in the area and the distribution of all rocks and most fine sediment can be related to the current regime. (Knapp-USGS)
W71-09308

THE OFFSET COURSE OF THE ST. JOHNS RIVER, FLORIDA,
North Carolina Univ., Chapel Hill.
William A. Pirkle.
Southeastern Geology, Vol 13, No 1, p 39-59, May 1971. 21 p, 8 fig, 3 tab, 25 ref.

Descriptors: *Geomorphology, *Rivers, *Valleys, *Florida, *Karst, Limestones, Aquifers, Channels, Surface-groundwater relationships, Erosion, Discharge (Water), Topography, Springs.
Identifiers: *St. Johns River (Fla).

The northward-flowing St. Johns River is the dominant river in eastern peninsular Florida. At a point east of Sanford, Florida, the river turns toward the west to reach an older valley that it follows northward almost to Palatka before turning to the east to flow again over a younger terrain. The offset valley probably marks part of the course of an ancestral river. Factors believed to be important in the development of the valley include faulting and fracturing, solution of carbonate sediments, and favorable structures for artesian discharge. The preservation of the offset valley as a major stream course is due primarily to the discharge of large quantities of artesian water. Much of this discharge is made possible in the northern part of the offset area by the relatively permeable nature of the aquiclude and in the central and southern areas of the offset by the exposure of the aquifer. The numerous springs from Lake George southward mark sites where the aquifer is exposed or breached. (Knapp-USGS)
W71-09309

EXPERIMENTS ON THE ANGLES OF REPOSE OF GRANULAR MATERIALS,
Research Council of Alberta, Edmonton.
Maurice A. Carrigy.
Sedimentology, Vol 14, No 3/4, p 147-158, July 1970. 12 p, 5 fig, 5 tab, 4 ref.

Descriptors: *Slope stability, *Avalanches, *Sedimentary structures, Topography, Soil stability, Landslides, Sedimentation, Stratification, Dunes.
Identifiers: *Angle of repose (Sediments).

A simple apparatus for measuring the angles of repose of masses of granular material in various media is based on the rotating-drum principle. Two angles of repose are measured by this method. The critical angle of repose is defined as the angle through which a mass of granular material can be rotated before it fails by avalanching, and the angle of rest is defined as the inclination of the slope after avalanching has ceased. For materials with similar surface characteristics the angles of repose increase with departure of the grains from a spherical form. For masses of spherical particles the angles of repose increase with increasing intergranular friction caused by differences in surface characteristics. For mixtures of spheres and cubes the angles of repose are proportional to the volumes of the end members present. For natural quartz sands the critical angle of repose is always greater in air than under water, but the angle of rest is the same in both media. (Knapp-USGS)
W71-09314

THE TIDE-SWEPT CONTINENTAL SHELF SEDIMENTS BETWEEN THE SHETLAND ISLES AND FRANCE,
National Inst. of Oceanography, Wormley (England).
N. H. Kenyon, and A. H. Stride.
Sedimentology, Vol 14, No 3/4, p 159-173, July 1970. 15 p, 8 fig, 32 ref.

Descriptors: *Bottom sediments, *Sediment transport, *Continental shelf, Tides, Tidal effects, Tidal waters, Currents (Water), Bed load, Ripple marks, Littoral drift, Surveys, Sounding, Sampling, Acoustics.
Identifiers: *Tidal currents, *Irish Sea, Bristol Channel.

Extensive data obtained by side-scan Asdic and echo-sounder equipments, viewed in conjunction with bottom notations on navigational charts and some sea-bed samples, show the widespread occurrence of sand ribbons, sand waves and sand patches on the continental shelf west of the British Isles and France. The close similarity of their directional trends with those of the strongest tidal currents strongly suggests a causal relationship which applies to much of the continental shelf, parts of the upper continental slope and also to off-lying shoals such as Rockall Bank. The sand transport paths broadly parallel the coasts in the epicontinental seas and on the open shelf west of the British Isles. In contrast, the paths are substantially normal to much of the coast of western France. (Knapp-USGS)
W71-09315

PHREATIC VERSUS VADOSE METEORIC DIAGENESIS OF LIMESTONES: EVIDENCE FROM A FOSSIL WATER TABLE,
Texas Univ., Austin. Dept. of Geological Sciences.
Lynton S. Land.
Sedimentology, Vol 14, No 3/4, p 175-185, July 1970. 11 p, 6 fig, 2 tab, 14 ref. NSF Grant GA-901; ACS PRF 3395-A2.

Descriptors: *Diagenesis, *Limestones, *Groundwater movement, *Weathering, *Aeolian soils, Water table, Dunes, Infiltration, Calcium carbonate, Sands, Percolation, Soil water movement, Water chemistry, Sedimentation, Stratigraphy, Water levels, Water level fluctuations.
Identifiers: *Bermuda.

The Middle Pleistocene Belmont Formation of Bermuda consists in part of beach-dune biocalcarenites which underwent intense contemporaneous cementation and diagenesis. The beach deposits were contemporaneously cemented by fibrous isophacous cement to form beachrock, whereas previously deposited eolianites further inland underwent intense meteoric phreatic diagene sis, resulting in coarse-grained cementation and stabilization of most of the metastable component of the rock. Above the Belmont water table, vadose diagenesis was relatively ineffective in cementing and altering the biocalcarenites. Phreatic meteoric diagenesis is interpreted to be a very rapid process relative to vadose meteoric diagenesis, and to resul in a much coarser-grained sparite. (Knapp-USGS)
W71-09316

LATE PLEISTOCENE DIAGENESIS AND DOLOMITIZATION, NORTH JAMAICA,
Texas Univ., Austin. Dept. of Geological Sciences and California Inst. of Tech., Pasadena. Div. o Geological Sciences.
Lynton S. Land, and S. Epstein.
Sedimentology, Vol 14, No 3/4, p 187-200, July 1970. 14 p, 6 fig, 3 tab, 32 ref.

Descriptors: *Diagenesis, *Limestones, *Reefs *Carbonate rocks, *Coral, Algae, Water chemistry, Sea water, Dolomite, Rain water, Solubility, Calcite, Mineralogy, Equilibrium, Magnesium, Pleistocene epoch.
Identifiers: *Jamaica.

Diagenesis, including dolomitization, of Late Pleistocene reefs of North Jamaica is due to reaction with meteoric water. Although the reaction Mg-calcite to calcite, Aragonite to calcite, and Mg calcite to dolomite retain microarchitectural information, complete chemical redistribution take place so that incongruently dissolved Mg-calcites aragonite inversion mosaics (neomorphosed aragonite), and dolomitized red algae have simila isotopic compositions, resembling precipitated calcite cements. The minerals all appear to hav stabilized in the meteoric water environment. The dolomite is not widely distributed, and is restricted to replacement of red algae. There has been no ne addition of magnesium to the red algal clasts. (K napp-USGS)
W71-09317

SELF-OPERATED PIPETTE FOR GRAIN-SIZE ANALYSIS: A PROTOTYPE,
Florence Univ. (Italy). Inst. of Geology.
For primary bibliographic entry see Field 07B.
W71-09318

EXPERIMENTAL STUDY OF THE SORPTION OF POTASSIUM BY MONTMORILLONITE,
Akademiya Nauk SSSR, Moscow. Geologicheski Institut.
V. I. Muravyov, and B. A. Sakharov.
Sedimentology, Vol 15, No 1/2, p 103-113, Oc 1970. 11 p, 3 fig, 1 tab, 12 ref.

Descriptors: *Clay minerals, *Montmorillonite *Ion exchange, *Diagenesis, *Potassium, Wate chemistry, Mineralogy, Clays, Silicates, Cation ad sorption.
Identifiers: Rectorite.

Experimental studies on saturation of montmori lonite with potassium showed that sorption o potassium tends to produce a regular alternation o the interlayer regions. The sorption nature of th potassium fixation by montmorillonite appears t form the basis of the epigenetic formation o rectorite. Comparison of the series of probabili curves indicates that as concentrations of K in crease, it is abosorbed in two phases with an obv ous tendency to fixation in interlayer regions i every second layer. The tendency to regular alter nation of montmorillonite and mica-like interlaye regions in rectorite-type minerals arises at earl stages of the process and is manifested in an 'orde red' interlayer sorption of cations. The progressiv development of this process in the sedimentary se ries logically concludes to the substitution of Al fo Si, primarily in layers already prepared for this by general concentration of a positive charge. (K napp-USGS)
W71-09319

FORMATION OF CARBONATE CEMENT IN CLASTIC ROCKS,
Akademiya Nauk SSSR, Moscow. Geologicheskii nstitut.
V. I. Muravyov.
Sedimentology, Vol 15, No 1/2, p 139-145, Oct 1970. 7 p, 3 fig, 5 ref.

Descriptors: *Diagenesis, *Calcite, *Carbonates, *Sandstones, Crystallization, Temperature, Pressure, Water chemistry, Magnesium, Iron, Clays minerals, Colloids, Aqueous solutions.
Identifiers: *Carbonate cements, Clastic rocks.

The texture of carbonate cement in clastic rocks reflects the conditions of: (1) free pore crystallization; or (2) recrystallization under elevated temperatures and pressures. Fibrous carbonate cement may be formed as a result of preferential adsorption of clay particles or colloids in the direction perpendicular to c. Cryptocrystalline carbonate cement is formed in sandstones if the ratio of carbonate to argillaceous matter is less than 5 (for montmorillonite) or less than 3-4 (for illite). The maximum amounts of isomorphic admixtures of Mg and Fe in calcite cement can be used for temperature reconstructions of the epigenetic environment. In deep-buried rocks, which are almost closed systems, migration rates are lower than diffusion rates. Microenvironments of detrital grain corrosion may exist adjacent to those of precipitation of the same mineral. (Knapp-USGS)
W71-09320

THE ORIGIN AND SIGNIFICANCE OF SAND VOLCANOES IN THE BUDE FORMATION CORNWALL),
Oxford Univ. (England). Dept. of Geology and Mineralogy.
R. V. Burne.
Sedimentology, Vol 15, No 3/4, p 211-228, Dec 1970. 18 p, 12 fig, 2 tab, 13 ref.

Descriptors: *Sand boils, *Sediments, *Deposition (Sediments), *Quicksand, *Compaction, Permeability, Pressure, Flow, Porous media, Subsidence.
Identifiers: *Sand volcanoes, *Fluidized sands.

Sand volcanoes are found in three sedimentary associations in the Upper Carboniferous Budge Formation. In two of these associations they formed when the dewatering of fluidized sand beds was temporarily inhibited by the deposition of overlying units. In the third association the volcanoes formed during the normal post-depositional compaction of fluidized, muddy, poorly sorted units deposited from subaqueous mudflows. The tops of fluidized sand beds were characteristically sheared by a fairly powerful current immediately after being deposited, while the waters above the recently deposited mudflow units were commonly stagnant, allowing sand volcano formation. (Knapp-USGS)
W71-09321

MINERAL STUDIES IN THE GRAVITATION-GRADIENT FIELD: 1. THE METHOD,
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
M. Ya. Katz.
Sedimentology, Vol 15, No 1/2, p 147-159, Oct 1970. 13 p, 4 fig, 1 tab, 18 ref.

Descriptors: *Density, *Mineralogy, *Instrumentation, *Bouyancy, *Hydrometry, Specific gravity, Temperature, Separation techniques.

New equipment is described for investigating the density properties of minerals and rocks. A description is given of the principle and operation of a liquid density-gradient tube, of density standards and of a device for the precise determination and separation of minerals. The possibility of using the method described for geological and mineralogical studies is discussed. (See also W71-09323) (Knapp-USGS)
W71-09322

MINERAL STUDIES IN THE GRAVITATION-GRADIENT FIELD: 2. CHANGES OF QUARTZ SAND DENSITY DUE TO NATURAL AND EXPERIMENTAL 'MATURATION',
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
M. Ya. Katz, M. M. Katz, and A. A. Rassakazov.
Sedimentology, Vol 15, No 1/2, p 161-177, Oct 1970. 17 p, 7 fig, 4 tab, 9 ref.

Descriptors: *Sedimentation, *Abrasion, *Quartz, *Sands, *Density, *Weathering, Erosion, Scour, Instrumentation, Silica, Mineralogy, Crystallography.
Identifiers: Quartz sand.

Studies of natural quartz and laboratory experiments on mechanical and chemical destruction of quartz show that the statistical density characteristics of detrital quartz change during sedimentary processes. Grains with defective structure, gas-liquid inclusions, inclusions of organic matter and other lighter minerals have lesser densities, whereas grains with inclusions of heavier minerals have larger densities than those of optically pure grains. The susceptibility to destruction is less for optically pure grains than for grains with lower or higher density. This is responsible for the increasing maturity of quartz sand during weathering and transport as indicated by the increasing percentage of optically pure grains. Mathematical modelling of the dynamics of this process was carried out. (See also W71-09322) (Knapp-USGS)
W71-09323

2K. Chemical Processes

ANALYSIS OF WATER FOR MOLECULAR HYDROGEN CYANIDE,
North American Rockwell Corp., Athens, Ga. Rocketdyne Div.
For primary bibliographic entry see Field 05A.
W71-08952

CHEMICAL CHARACTERISTICS OF PRECIPITATION IN THE CHAMPLAIN VALLEY,
Vermont Univ., Burlington. Dept. of Zoology.
E. B. Henson.
Available from the National Technical Information Service as PB-200 167, $3.00 in paper copy, $0.95 in microfiche. Completion Report, June 1971. 10 p, 5 tab, 1 ref. OWRR Project A-007-VT (1).

Descriptors: *Precipitation (Atmospheric), Calcium, Sodium, Magnesium, Potassium, Chloride, Sulfate, Vermont, *Ions, *Champlain Valley.

More than 1000 precipitation water samples were collected from a number of stations in the Champlain Valley, and six ions were measured (Ca, Na, Mg, K, Cl, SO sub 4). As anticipated, considerable variation existed between rains, and between stations. Concentrations were generally higher in urban locations than in rural stations. The median concentration for all samples were: Ca, 1.25; Na, 0.28; Mg, 0.20 K, 0.19; Cl, 1.7; and SO sub 4, 1.9 mg/l. When concentrations were examined on a seasonal basis, higher concentrations were observed during the winter months with the exception of SO sub 4 which was lowest in the winter. The median monthly loads in kg/km sq were: Ca, 99; Na, 36, Mg, 15, K, 21; Cl, 134; and SO sub 4, 147 kg/km sq. Precipitation brings down about 450 kg/km sq/month. The concentrations of the six ions, when compared with a high elevation mountain pond, indicate more Cl in rainfall than in the pond water.
W71-08973

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR NORTH CREEK, TRINITY RIVER BASIN, TEXAS - 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-09080

PRECIPITATION, ITS CHEMICAL COMPOSITION AND EFFECT ON SOIL WATER IN A BEECH AND A SPRUCE FOREST IN SOUTH SWEDEN,
Lund Univ. (Sweden). Dept. of Plant Ecology.
Bengt Nihlgard.
Oikos, Vol 21, No 2, p 208-217, 1970. 10 p, 7 fig, 4 tab, 27 ref.

Descriptors: *Water chemistry, *Rainfall, *Forests, Leaching, Soil water, Infiltration, Throughfall, Stem flow, Interception, Nutrients, Aerosols, Sampling.
Identifiers: *Sweden.

The quantitative distribution and the chemical composition of the rainfall in a 100-year old beech forest and a neighboring 55-year old planted spruce forest are reported. Average annual values of throughfall, stem flow and interception are estimated as 70%, 11%, and 19% for the beech forest and 58%, 3%, and 39% for the spruce forest of the incident rainfall in an open field. The soil of the spruce forest is about 19% drier than that of the beech forest, because of high interception and long transpiration period of the former forest. The following chemical features are discussed: pH, conductivity, amounts of Na, K, Ca, Mg, Mn, Cl, SO4-S, PO4-P and tot.-N. Extrapolated annual values of nutrients in the throughfall plus stem flow amount to 107 kg/ha and 215 kg/ha in the beech and the spruce forests respectively. A high percentage of the nutrients must derive from dry deposited aerosols, particularly for Na, Mg, Cl and Ca. The higher amounts of nutrients in the rainfall of the spruce forest probably derived from stronger leaching processes in the canopy. (Knapp-USGS)
W71-09081

GEOLOGY AND GROUNDWATER RESOURCES OF TRAILL COUNTY: PART 3 GROUNDWATER RESOURCES,
Geological Survey, Bismark, N. Dak.
For primary bibliographic entry see Field 02F.
W71-09090

VARITATIONS IN DELTA S-34 IN SULFATES OF RECENT AND OLD SEA BASINS OF THE USSR (Russian: Variatsii del'ty S-34 v sul'fatakh sovremennykh i drevnikh morskikh vodoyemov Sovetskogo Soyuza),
Vsesoyuznyi Neftyanoi Nauchno-Issledovatelskii Geologorazvedochnyi Institut, Leningrad (USSR).
N. A. Yeremenko, and R. G. Pankina.
Geokhimiya, No 1, p 81-91, Jan 1971. 11 p, 3 fig, 3 tab, 18 ref.

Descriptors: *Sulfur, *Geochemistry, *Sedimentary basins (Geological), *Geologic time, *Stable isotopes, Stratigraphy, Sea water, Radioactive dating, Oceans, Sulfates, Sediments, Rocks, Anhydrite.
Identifiers: *USSR, Russian Platform, Caspian Sea, Black Sea, Evaporites, Peneplanation, Isotopic composition.

Changes in the isotopic composition of the sulfur of evaporites in a cross section of a sedimentary stratum of the USSR have the same trend as in other regions of the globe and strengthen the supposition that the isotopic composition of sulfur in sulfates of the world's oceans changes in the course of geologic time. A change in the isotopic composition of the sulfur of oceans is due to the interaction of three basic factors: (1) supply of sulfur enriched in S-34 from the depths of the earth; (2) microbiological fractionation of sulfur isotopes in oceans and on land (secondary sulfates); and (3) loss of sulfur enriched in S-32 during peneplanation of continents. The average isotopic composition of sulfur of the earth's crust as compared with sulfur of chondrites shows a 15-20% shift in the direction of S-34. A regular change in the isotopic composition of the sulfur of evaporites in a cross section of a sedimentary stratum may be used for determining the stratigraphic affiliation of sulfate-containing rocks. (Josefson-USGS)
W71-09098

RESULTS OF A STUDY OF ORGANIC MATTER IN GROUNDWATERS OF KAMCHATKA (Russian: Rezul'taty izucheniya organicheskikh veshchestv v podzemnykh vodakh Kamchatki),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
Ye. L. Bykova, G. A. Goleva, and Z. B. Dekusar.
Geokhimiya, No 2, p 225-237, Feb 1971. 13 p, 4 fig, 5 tab, 12 ref.

Descriptors: *Organic matter, *Groundwater, *Thermal water, *Rocks, Geochemistry, Water chemistry, Water analysis, Hydrogeology, Adsorption, Infiltration, Chromatography, Solvents.
Identifiers: *USSR, *Kamchatka, Mineralization.

A relationship was established between the organic matter composition of the groundwater of Kamchatka and the geochemical conditions of groundwater formation and composition of water-bearing rocks. The relationship between water-bearing rocks and the organic matter dissolved in groundwater is expressed by the leaching of organic matter from the rocks and by the adsorption of organic matter on the rocks. Experimental field studies show that it is possible to use data on the organic component of groundwater for determining groundwater genesis. A study of the composition of organic matter in widespread nitrogen thermal waters of Kamchatka confirms their infiltration origin. (Josefson-USGS)
W71-09099

CARBON MONOXIDE IN RAINWATER,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 02B.
W71-09105

SOLUTES IN PRESSURE MEMBRANE FILTRATES OF SEVERAL CLAY-WATER-ELECTROLYTE SYSTEMS,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 02G.
W71-09116

HEAT TRANSFER MEASUREMENT IN A GEOTHERMAL AREA,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 02F.
W71-09117

HEAT FLOW FROM NATURAL GEYSERS,
ESSA Research Labs., Boulder, Colo.; and Colorado Univ., Boulder. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02F.
W71-09118

GEOCHEMICAL DISTRIBUTION PATTERNS AND MIGRATION FORMS OF GOLD IN NATURAL WATERS (RUSSIAN: GEOKHIMICHESKIYE ZAKONOMERNOSTI RASPROSTRANENIYA I FORMY MIGRATSII ZOLOTA V PRIRODNYKH VODAKH),
All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).
G. A. Goleva, V. A. Krivenkov, and Z. G. Gudz'.
Geokhimiya, No 6, p 744-757, June 1970. 14 p, 5 fig, 6 tab, 15 ref.

Descriptors: *Gold, *Water chemistry, *Geochemistry, Thermal water, Connate water, Mineralogy, Chemical precipitation, Hydrogen ion concentration, Oxidation-reduction potential, Alkalis (Bases), Volcanoes, Sulfides, Organic matter.
Identifiers: *USSR, Transbaykal, Central Asia, Ural Mountains, Kamchatka, Dispersion halos, Fumaroles, Mineralization, natural water, Hydrogeochemistry.

Aqueous dispersion halos of the gold deposits of Eastern Transbaykal, Central Asia, Southern Urals and Kamchatka are largely the product of sulfuric acid, carbonic acid and hydrolytic decomposition of gold-containing minerals. The gold content in aqueous halos varies between 0.05 and 10 micrograms/liter. In natural waters with a pH of 5-8 and Eh of 0.1-0.5 volts, gold migrates in the form of uncharged particles and complex organic compounds. In the presence of thiosulfate ions gold may form extremely stable thiosulfate complexes. Chloride and bromide complexes of gold can be formed only in strongly acidic waters with an Eh greater than 0.9 volts and a pH of less than 1. Under natural conditions these types of waters are found only in hydrochloric-acid fumaroles of active volcanoes. A sulfuric acid medium is unfavorable for the migration of gold; thus, the gold content in interstitial waters of intensively oxidized gold-sulfide deposits does not exceed 0.1-0.15 micrograms/liter. Judging from the composition of new formations of gold deposits in the supergene zone and from correlations with other chemical elements in natural waters, the most common coprecipitators of gold are iron hydroxides, calcium carbonate, disulfides and colloidal silicic acid. (Josefson-USGS)
W71-09119

INFLUENCE OF VOLCANIC ROCKS ON THE COMPOSITION OF HYDROTHERMAL SOLUTIONS (RUSSIAN: VLIYANIYE VULKANOGENNYKH POROD NA SOSTAV GIDROTERMAL'NYKH RASTVOROV),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
N. I. Khitarov, A. G. Khundadze, E. E. Senderov, and N. P. Shibayeva.
Geokhimiya, No 6, p 678-692, June 1970. 15 p, 8 fig, 5 tab, 32 ref.

Descriptors: *Igneous rocks, *Water chemistry, *Chemical analysis, *Aqueous solutions, Geochemistry, Petrography, Alkali metals, Hydrogen ion concentration, Alkalinity, Acidity, Silica, Chlorides, Calcium.
Identifiers: *USSR, *Georgian SSR, Hydrothermal solutions.

An examination is made of the interaction of water and various aqueous solutions with volcanic rocks collected in the Georgian SSR and with artificial glasses prepared from the rocks at temperatures of 200 deg and 300 deg C and 300 atm. The relative decomposition rate for acidic and basic igneous rocks exposed to water and chloride solutions of sodium, potassium and calcium is approximately the same and decreases for basic solutions. The total concentration of the solution obtained after interaction with the rocks increases as the solution changes from water to chloride and thence to basic solutions. Silica-saturated solutions result from interaction of water with volcanic rocks containing amorphous glassy material. The principal components of rocks entering neutral and basic solutions are silica and alkalis; alumina, iron and magnesium are generally only slightly mobile and are accumulated in the residual solid phase. Volcanic rocks in interaction with basic solutions assume a buffer role: the pH of the end solutions approaches 7.0 and does not deviate from neutral by more than 2-3 units. (Josefson-USGS)
W71-09120

HYDROGEOCHEMISTRY OF SEDIMENTARY (INTERSTITIAL) BRINES OF SALT DEPOSITS (RUSSIAN: K GIDROGEOKHIMII SEDIMENTATSIONNYKH RASSOLOV SOLYANYKH MESTOROZHDENIY),
G. V. Bel'tyukov.
Geokhimiya, No 9, p 1131-1135, Sept 1970. 5 p, 1 fig, 4 tab, 13 ref.

Descriptors: *Brines, *Salts, *Geochemistry, Chemical analysis, Saline water, Magnesium, Chlorine, Calcium, Potassium, Specific gravity.
Identifiers: *USSR, Hydrogeochemistry, Salt deposits, Mineralization, Bromine.

The composition of brines of several rock salt and potassium deposits of the USSR is examined. Although sedimentary (interstitial) brines represent partially metamorphosed brines, their chemical composition in the various deposits is basically the same. All brines are of the chloride type and have a high mineralization, a high specific gravity, high magnesium and bromine contents, and a low sodium content with respect to contact leaching brines. The calcium content is directly dependent upon the degree of brine metamorphism. The presence of iron and lithium is typical of the interstitial brines of some deposits. The brines often contain methane, hydrogen sulfide and nitrogen gases. The intraformational waters of salt rocks examined are, by their nature and formation conditions, buried sedimentary (Interstitial) brines. (Josefson-USGS)
W71-09121

THE STUDY OF THE PHYSICAL, CHEMICAL AND BIOLOGICAL NATURE OF WATER QUALITY UNDER UTAH CONDITIONS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05A.
W71-09268

WATER ANALYSIS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W71-09289

ORIGIN OF PACIFIC OCEAN IRON-MANGANESE NODULES FROM RADIOISOTOPE DATA, (RUSSIAN: PROISKHOZHDENIYE ZHELEZO-MARGANTSEVYKH KONKRETSIY TIKHOGO OKEANA PO DANNYM O RADIOIZOTOPAKH),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 05A.
W71-09306

PHREATIC VERSUS VADOSE METEORIC DIAGENESIS OF LIMESTONES: EVIDENCE FROM A FOSSIL WATER TABLE,
Texas Univ., Austin. Dept. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W71-09316

LATE PLEISTOCENE DIAGENESIS AND DOLOMITIZATION, NORTH JAMAICA,
Texas Univ., Austin. Dept. of Geological Sciences; and California Inst. of Tech., Pasadena. Div. of Geological Sciences.
For primary bibliographic entry see Field 02J.
W71-09317

2L. Estuaries

REVIEW OF THE FEDERAL WATER QUALITY ADMINISTRATION ESTUARINE STUDY FINDINGS,
Environmental Protection Agency, Boston, Mass. Water Quality Office.
For primary bibliographic entry see Field 05G.
W71-08945

SIMULATION OF TIDAL MOTION IN COMPLEX RIVER SYSTEMS AND INLETS BY A METHOD OF OVERLAPPING SEGMENTS,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
R. F. Henry.
Department of Energy, Mines and Resources, Marine Sciences Branch Manuscript Report Series No 17, 1971. 30 p, 11 fig, 4 ref.

Descriptors: *Tidal waters, *Water circulation, *Tides, *Water level fluctuations, *Inlets (Waterways), *Model studies, Numerical analysis.

Analytical techniques, Turbulent flow, Turbulent boundary layers, Coasts, Rivers, Oceans, Breakwaters.
Identifiers: *Tidal motion.

A method is proposed to facilitate digital and hybrid computation of tidal motions for a coastal inlet or river system in which there are many bifurcations, confluences, islands, etc. The inlet is divided into overlapping segments and the tidal motion is computed for each segment separately over a time increment short enough to ensure that errors due to neglect of neighboring segments are confined to the regions of overlap. The tidal motion for the whole inlet at the end of each time increment is found by discarding erroneous portions of the solutions for the various segments and piecing together the remaining parts. A simple numerical experiment was used to test the validity of the proposed method in a known physical situation and to compare various methods of linking adjacent segments. (Woodard-USGS)
W71-09093

PRELIMINARY INVESTIGATION OF THE SURFICIAL SEDIMENTS IN THE CAPBRETON CANYON (SOUTHWEST FRANCE) AND THE SURROUNDING CONTINENTAL SHELF,
Institut de Geologie du Bassin d'Aquitaine, Talence (France).
For primary bibliographic entry see Field 02J.
W71-09100

THE TENTH INTERNATIONAL MICROBIOLOGICAL CONGRESS, (In Russian),
For primary bibliographic entry see Field 02H.
W71-09161

ANALOG SIMULATION OF POPULATION AGE STRUCTURES,
Maryland Univ., Solomons.
Donald R. Heinle.
University of Maryland, Natural Resources Institute, Chesapeake Biological Laboratory report, Sep 1970. 19 p, 6 fig, 2 tab, 10 ref. OWRR Project No A-002-MD (9).

Descriptors: Simulation analysis, Analog computers, Population, Age, Mortality, Copepods, Crustaceans.
Identifiers: *Acartia tonsa, *Steady-state demographic equations.

A simulation of population age structures was shown by the use of analog computers with steady state-demographic equations. The survivorship curve of a wild population of the calanoid copepod, Acartia tonsa, was observed to be very close to a negative exponential function, in spite of the fact that many of the known predators selected older copepods. The question examined of whether a small amount of selective predation would alter the age structure of the copepod population in a recognizable way. Of major importance was the fact that while a non-selective mortality did not alter the birthrate, b, or the stable age distribution, Cx, a selective mortality did. (Veverka-Cornell)
W71-09214

SYSTEMS OF ENGINEERING AND DEVELOPMENT OF COMMERCIALLY VALUABLE MARINE RESOURCES IN THE DELAWARE REGION,
Delaware Univ., Newark. Coll. of Marine Studies.
J. S. Gaither, D. L. Maurer, J. R. Mather, D. R. Carman, and T. H. Williams.
Available from the National Technical Information Service as PB-198 082, $3.00 in paper copy, $0.95 in microfiche. Sea Grant Project Final Report, Dec 8, 1970.

Descriptors: *Aquatic producitivity, *Oysters, *Foods, *Economic feasibility, Delaware, Cost analysis, Simulation analysis, Marine animals.
Identifiers: *Aquaculture, *Seafood industries, *Economic development, Computerized simulation, Cost estimates, Biology, Education, Hybridization, Systems engineering, Sea Grant project, *Marine resources.

Revival of Delaware's oyster industry was emphasized. A systems engineering study provided a computer simulation of a closed environment oyster plant which will be used to design the plant and analyze the effect of changes on investment and operating costs. Practical procedures were developed for breeding oysters including command spawning, supplemental feeding and environmental control; all necessary for the design of a commercial oyster hatchery with the potential for a lengthened spawning season and accelerated growth rate of larvae. This program also strengthened the faculty and curricula in Marine Science and Engineering and contributed materially to the decision to establish the College of Marine Studies.
W71-09259

MERCURY IN A COASTAL MARINE ENVIRONMENT,
Southampton Univ. (England).
For primary bibliographic entry see Field 05A.
W71-09293

HYDROLOGY OF COASTAL WATERS,
Texas A and M Univ., College Station; and Texas Engineering Experiment Station, College Station. Coastal and Ocean Engineering Div.
Lawrence E. Newbolt, and John B. Herbich.
Available from National Technical Info Service, Operations Division, Springfield, Virginia, 22151, as PB-197 628, $3.00 in paper copy, $0.95 in microfiche. Hydrology of Coastal Waters, Coastal and Engineering Division Report No 133, Aug 1970. 91 p, 18 fig, 40 ref. Sea Grant Publication No TAMU-SG-70-225.

Descriptors: *Coasts, *Estuaries, *Tidal marshes, *Hydrologic data, *Saline water intrusion, *Silting, Temperature, Dissolved oxygen, Phosphorus, Nitrogen, Mixing, Currents, Tides, Runoff, Inflow, Evaporation, Rainfall, Geology.

Selected literature on coastal and estuarine hydrology is reviewed and summarized. An estuary is defined and the hydrologic data collection, salinity intrusion, siltation, hydrologic implications of deepwater channels are presented in detail for tidal estuaries. Suggestions for further research are made. (Ensign-PAI)
W71-09365

WHAT'S HAPPENING TO OUR SALT WATER MARSHES,
New York State Dept. of Environmental Conservation, Albany. Div. of Marine and Coastal Resources.
For primary bibliographic entry see Field 06G.
W71-09410

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

INVARIANT IMBEDDING, ITERATIVE LINEARIZATION, AND MULTISTAGE COUNTERCURRENT PROCESSES III. ESTIMATION AND THE OVER-DETERMINED SYSTEM,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 06A.
W71-09219

SALINE WATER CONVERSION ACT OF 1971 (A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO CONTINUE RESEARCH AND DEVELOPMENT FOR THE TREATMENT OF SALINE AND OTHER CHEMICALLY CONTAMINATED WASTE WATER TO MAINTAIN OR IMPROVE THE QUALITY OF WATER).
For primary bibliographic entry see Field 06E.
W71-09435

3B. Water Yield Improvement

SIMULATION OF WATER YIELD FROM DEVEGETATED BASINS,
Hydrocomp International, Palo Alto, Calif.
George Fleming.
Journal of the Irrigation and Drainage Division, ASCE, Vol 97, No IR 2, Proc Paper 8175, p 249-262, June 1971. 14 p, 5 fig, 7 tab, 9 ref, 2 append.

Descriptors: *Drainage, *Irrigation, *Vegetation, *Watersheds (Basins), Computers, Mathematical models, Management, Rivers, Simulation analysis, Water yield.
Identifiers: *Sisquoc River, *Santa Ynez River, Devegetated basins.

The application of a model called Hydrocomp Simulation Program for water shed simulation was considered with specific reference to studying the effects of vegetation management on water yields. In addition, other features of the highly interactive problem of water resources were highlighted in the form of sediment transport and water quality changes. If the balance of nature is altered, a chain reaction occurs. Examples were presented where the effects of wild forest fires on water yield were demonstrated quantitatively for the Sisquoc and Santa Ynez Rivers in California. The results of this study were then extended to determine the long term effect of planned vegetation management on both watersheds for the complete period of streamflow record. The results were presented and showed conclusively that the removal of vegetation for a watershed increases the water yield. (Veverka-Cornell)
W71-09001

NORTH ATLANTIC REGIONAL WATER RESOURCES STUDY: APPENDIX D - GEOLOGY AND GROUND WATER (FINAL DRAFT),
Geological Survey, Arlington, Va. and Geological Survey, Hartford, Conn.
D. J. Cederstrom, John A. Baker, and George R. Tarver.
North Atlantic Regional Water Resources Study Coordinating Committee Report, March 1971. 240 p, 17 fig, 2 plate, 14 tab, 34 ref.

Descriptors: *Water resources development, *Northeast U. S., *Hydrogeology, *Water yield, *Groundwater, Conjunctive use, Surface-groundwater relationships, Aquifers, Aquifer characteristics, Coastal plains, Glacial drift, Water wells, Safe yield, Water quality.
Identifiers: North Atlantic Region (U. S.).

Large volumes of groundwater, from a few million to several tens of millions of gallons a day per well field, are available in the North Atlantic Region in much of the Coastal Plain; in belts of sandstone and carbonate rock (limestone and dolomite), particularly where these have been folded and faulted; and in glacial sand and gravel beds, generally adjacent to rivers and large streams. The average yield of wells in sandstone and carbonate rock is, respectively, 150 and 300 gpm. In favorable locations, wells in Coastal Plain sediments may yield in excess of 2,000 gpm and many wells in glacial deposits yield more than 700 gpm. Smaller quantities of groundwater, generally less than 75 gpm, are available from wells throughout the region in areas underlain by crystalline rocks and shale. The total volume of groundwater available in each basin is estimated and shown in tables. The quality of groundwater is generally good. (Knapp-USGS)

W71-09106

A PRELIMINARY EVALUATION OF BANK STORAGE ASSOCIATED WITH LIBBY RESERVOIR IN NORTHWESTERN MONTANA,
Geological Survey, Washington, D.C.
Donald L. Coffin.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402-Price 25 cents. Geological Survey Water-Supply Paper 1899-L, 1970. 25 p, 7 fig, 3 tab, 3 ref.

Descriptors: *Bank storage, *Reservoirs, *Aquifer characteristics, *Water table, *Montana, Model studies, Analog models, Hydrogeology, Aquifers, Reservoir yield, Groundwater, Transmissivity, Storage coefficient, Reviews, Reservoir construction.
Identifiers: *Libby Reservoir (Mont), Reservoir morphology.

Permeable sand and gravel deposits beneath the floor of the Rocky Mountain Trench in northwestern Montana and Southeastern British Columbia will become saturated and provide additional storage for Libby Reservoir, which is scheduled to begin filling in 1972. Because subsurface geologic data are insufficient to predict accurately the amount of usable bank storage, plans cannot be made to use this water for project purposes. An electric analog of the area is too crude to make final estimates of bank storage, but the model study points out that the distribution of active bank storage along the reservoir is mainly a function of the size and shape of the reservoir stage hydrograph and of the slope of the floor of the reservoir. The magnitude of active bank storage is controlled by transmissivity and storage coefficient. The model study indicates that geologic data necessary to evaluate bank storage accurately need only be collected over about one-fourth of the length of the reservoir and within about 2 miles of its edge. The study allowed the estimated cost of the data collection plan to be reduced by about half. (Woodard-USGS)
W71-09137

A GUIDE TO AQUATIC SMARTWEEDS (POLYGONUM) OF THE UNITED STATES,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 05G.
W71-09151

PRODUCTION, MINERAL NUTRIENT ABSORPTION, AND BIOCHEMICAL ASSIMILATION BY JUSTICIA AMERICANA AND ALTERNANTHERA PHILOXEROIDES,
Auburn Univ., Ala. Agricultural Experiment Station.
For primary bibliographic entry see Field 05C.
W71-09178

A PLASTIC BARRIER FOR SPOT TREATMENT OF AQUATIC VEGETATION,
Texas Parks and Wildlife Dept., Waco.
For primary bibliographic entry see Field 05C.
W71-09179

LARGE SCALE EFFECTS OF CLOUD SEEDING. 1969-70 SEASON AND TWO YEAR SUMMARY,
Aerometric Research, Inc., Goleta, Calif.
Keith J. Brown, and Robert D. Elliott.
Available from the National Technical Information Service, $3.00 in paper copy, $0.95 in microfiche. Bureau of Reclamation Contract Report ARI-70-20, Oct 1970. 25 p.

Descriptors: *Artificial precipitation, Meteorological instruments, Sampling, Wind, California, *Cloud seeding, *Weather modification.
Identifiers: Statistical analysis, Periodic variations, Air mass analysis, Atmospheric precipitation.

This report covers the results of two years of field testing to determine the existence, magnitude and causes of large scale effects of cloud seeding. The field program was located north and east of an ongoing research seeding project by North American Weather Consultants under contract to the Naval Weapons Center. Substantial evidence is presented showing that precipitation has been more than doubled over a large area about 70 miles downwind from a point seeding source in Santa Barbara County, California. The causes of those increases have not yet been determined, but preliminary results indicate they are related to air mass temperature and wind speed and direction.
W71-09265

DRAINAGE MAINTENANCE AND RECONSTRUCTION COSTS AND BENEFITS: A WATERSHED ANALYSIS,
Manitoba Univ., Winnipeg. Dept. of Agricultural Economics and Farm Management.
James A. MacMillian, and Geoffrey A. Norton.
Canadian Journal of Agricultural Economics, Vol 18, No 3, p 56-63, Nov 1970. 1 figure, 7 references.

Descriptors: *Drainage programs, *Cost-benefit analysis, *Regression analysis, *Economic efficiency.
Identifiers: *Interlake Area of Manitoba, Icelandic watershed, Fund for Rural Economic Development.

This paper attempts to identify and apply economic criteria to the drainage process in the Interlake area of the province of Manitoba. The shortcomings of resource modification decisions based on single use concepts and the need for including pervasive drainage effects on the economy are outlined. A regression model, utilizing the important variables involved in drainage reclamation account for the major portion of the variation in benefits among farms. Although a cost-benefit figure of 1:6 is estimated, its interpretation is constrained by the particular economic relationship investigated, the partial nature of the analysis and the desirability of the distribution of drainage benefits. Drainage is a means of distributing income to low income farmers even though large farms receive the greatest share of benefits. (Holmes-Rutgers)
W71-09393

3D. Conservation in Domestic and Municipal Use

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN SOUTHERN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 07C.
W71-09091

HYDROLOGIC AND QUALITY CHARACTERISTICS OF THE LOWER MISSISSIPPI RIVER,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02E.
W71-09103

3E. Conservation in Industry

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN SOUTHERN MISSISSIPPI,
Geological Survey, Jackson, Miss.
For primary bibliographic entry see Field 07C.
W71-09091

3F. Conservation in Agriculture

IDENTIFICATION OF IRRIGATION RETURN WATER IN THE SUB-SURFACE, PHASE III: KAHUKU, OAHU AND KAHULUI AND LAHAINA, MAUI,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05B.
W71-08972

RAINFALL USE EFFICIENCY FOR DRYLAND BARLEY WITH THREE CROP AND WATER MANAGEMENT SYSTEMS,
Agricultural Research Service, Riverside, Calif.; and California Univ., Riverside.
R. E. Luebs, and A. E. Laag.
Soil Science Society of America Proceedings, Vol 35, No 2, p 336-339, Mar-Apr 1971.

Descriptors: *Water utilization efficiencies, *Watermanagement (Applied), *Dry farming, Ponding, Water storage, Moisture availability, *Barley, Growth stages, Fallowing, Farm management, Crop production.
Identifiers: *Rainfall use efficiency, *Runoff concentration, Winter rainfall distribution.

Three crop and water management systems for barley (Hordeum vulgare L.) were compared in a winter rainfall climate on Hanford sandy loam. These systems were (1) annual cropping with runoff retention, (2) a fallow-crop sequence with runoff retention, and (3) induced runoff on one-half the area for concentration and annual cropping on the remaining half. Land slope was 2-3% and runoff was retained with dikes at 7.6-m intervals in the first two systems. Over a 3-year period average grain yields were 1.58, 2.04, and 2.29 ton/ha with rainfall use efficiences of 41, 29, and 31 kg/ha-cm for annual cropping, fallow-crop, and induced runoff concentration systems, respectively. The additional soil water in downslope areas of the annual and fallow-crop systems and in areas receiving induced runoff was reflected in increased barley kernels per head and greater kernel weight. Holding runoff on the land and cropping annually increased rainfall use efficiency 42% over both that obtained where runoff occurred in the annual cropping system and that obtained for the entire plot area in the fallow-crop system. The efficiency of fallow for storing water in the soil was 16.7%. (Luebs-USDA)
W71-08975

ESTIMATION AND USE OF WATER PRODUCTION FUNCTIONS IN CROPS,
Hebrew Univ., Rehovoth. Faculty of Agriculture.
Dan Yaron.
Journal of Irrigation and Drainage Division, ASCE, Vol 97, No IR2, Proc Paper 8208, p 291-303, June 1971. 13 p, 2 fig, 4 tab, 19 ref, 1 append.

Descriptors: *Crop response, *Plants, *Water consumption, *Water supply, Agronomy, Irrigation, Planning, *Irrigation efficiency.
Identifiers: Crop yield, Empirical estimation.

By comparing two major theories regarding plant response to water supply and different soil moisture levels (Veihmeyer and Hendrickson; and Furr and Taylor, Hagan et al.), problems of empirical estimation of water production functions in crops were reviewed and the importance of the estimates was illustrated by several examples. The major problem of empirical estimation of such functions was their specification and in particular the choice of the independent variables, the dependent one being the crop yield per land unit. The paper concluded that while production functions with fixed intraseasonal water distribution could be estimated by regression methods, difficulties were involved in the regression approach in the estimation of dated production functions. An attempt to conceptualize the plant growth in the framework of process analysis, aimed at the derivation of growth rules was suggested. (Veverka-Cornell)
W71-08997

EATED EFFLUENT - AN ASSET TO GRICULTURE,
'ashington State Office of Nuclear Energy evelopment, Seattle.
or primary bibliographic entry see Field 05C.
'71-09028

UTO-MECHANIZATION OF PIPE DISTRIBUION SYSTEMS,
epartment of Agriculture, Fort Collins, Colo; and ebraska Univ., Lincoln.
. R. Haise, and P. E. Fischbach.
merican Society of Agricultural Engineers Naonal Irrigation Symposium Paper, University of ebraska, Lincoln, Nov 1971, p M-1--M-15. 15 p, fig, 2 tab, 13 ref.

escriptors: *Automatic control, Mechanization, rigation, Irrigation systems, *Water reuse, *Irgation efficiency, Control systems, Sensors, Irgation engineering, Water distribution (Applied), pelines, *Furrow irrigation, Distribution systems, rinkler irrigation, Soil water, Cost comparisons, emote control, Costs, Tensiometers.

the last 5 yr, the major effort in automation of peline surface irrigation systems has been in the evelopment of: (1) a closure or diaphragm that uld automate pipe valves or outlets, (2) reliable ntrollers for remote operation, (3) improved esign of automatic valves, and (4) design of reuse stems adapted to automatic irrigation pipelines to hieve higher application efficiencies by recircuting runoff water. As a result, a reliable autoated surface irrigation system has been eveloped. The estimated cost of the system is mparable to self-propelled center pivot and less an automated solid-set sprinkler systems. The wer requirements for operating a sprinkler irgation system are considerably greater. Autoated surface irrigation systems adapt best to pes of less than 1.5%, and to soils with a medium low intake. The reuse of runoff water is an ingral part of the system. A combination of reuse d automatic surface-pipe irrigation systems has sulted in high water application efficiency and iformity coefficient. Automated surface irrigaon pipe with a reuse system can be used efficiently apply fertilizers because high coefficients of iformity are attained and the runoff water is used. (USBR)
71-09068

UTO-MECHANIZATION OF OPEN CHANNEL ISTRIBUTION SYSTEMS,
epartment of Agriculture, Kimberly, Idaho.; and epartment of Agriculture, Fort Collins, Colo.; d Oklahoma State Univ., Stillwater.
. S. Humpherys, J. E. Garton, and E. G. Kruse.
merican Society of Agricultural Engineers Naonal Irrigation Symposium Paper, University of ebraska, Lincoln, p L-1--L-20, Nov, 1970. 20 p, fig, 20 ref.

escriptors: *Irrigation, Irrigation design, Irrigaon systems, Check structures, Irrigation efficien, *Automatic control, Orifices, Valves, *Disbution systems, Furrow irrigation, Bibliogra-ies, Weirs, Gates, Tensiometers, Water distribuon (Applied), Sensors.

uto-mechanization enables an irrigation farmer to ply water more efficiently with minimum labor ing automatic and semiautomatic control vices. Semiautomatic systems require manual atntion during each irrigation while automatic stems normally operate without attention. In signing channels for automatic furrow irrigation, e distribution functions are considered using ocedures developed for computing decreasing ried flow. Water is usually distributed into invidual furrows using furrow tubes, orifices, or eirs in the side of open channels. Semiautomatic ructures include: checks, dams, normally closed tes, normally open gates, and portable and mole equipment. Many structures are controlled by echanical timers. Automatic irrigation equipment using external power for operation such as electricity or fluid pressure includes pneumatic lay-flat valves and hydraulically operated gates and valves that are often controlled by programmed timers or controllers. Structures utilizing energy of the flowing irrigation stream include center-of-pressure gates, sinking float gates, and fluid diverters. (USBR)
W71-09069

DESIGN CRITERIA FOR IRRIGATION SYSTEMS WITH COMPLEX PIPE LOOPS,
Nebraska Univ, Lincoln.
For primary bibliographic entry see Field 04A.
W71-09074

IRRIGATION OF WINTER WHEAT IN THE ROSTOV OBLAST (RUSSIAN: REZHIM OROSHENIYA OZIMOY PSHENITSY V ROSTOVSKOY OBLASTI),
V. A. Kozin.
Gidrotekhnika i Melioratsiya, No 12, p 65-69, Dec 1970. 5 p, 2 tab, 5 ref.

Descriptors: *Irrigation systems, *Surface irrigation, *Sprinkler irrigation, *Wheat, Irrigation water, Furrow irrigation, Crop production, Meteorological data.
Identifiers: *USSR, *Rostov Oblast, Sprinklers.

Experiments were conducted in the Rostov Oblast in 1964-68 to study the effectiveness of fall surface irrigation of winter wheat and to compare it with the effectiveness of pre- and post-planting sprinker irrigation. Experiments were conducted in six variants: (1) a control experiment without irrigation; (2) furrow surface irrigation before planting; (3) furrow surface irrigation after planting; (4) sprinkler irrigation before planting; (5) sprinkler irrigation after planting; and (6) sprinkler irrigation after planting plus one sprinkler irrigation during the growing season. The increase in yield from a fall surface irrigation of the soil was 150-220% of the yield obtained in the control experiment. Sprinkler irrigation after planting of wheat produced higher increases in grain yield than irrigation prior to planting. Maximum yields of winter wheat were obtained when 1-2 sprinker irrigations during a growing season were conducted in addition to surface irrigation. To establish a large base for grain production on irrigation lands of the oblast, it is necessary to construct hydraulic structures below the Tsimlyansk reservoir for regulating Don River runoff and build an additional conduit on the Don canal; these measures will make it possible to increase grain production by as much as sevenfold over the present (1968) figure. (Josefson-USGS)
W71-09131

IRRIGATION METHODS FOR MEADOWS AND PASTURES (RUSSIAN: TEKHNIKA POLIVA LUGOV I PASTBISHCH),
A. M. Polonskiy, M. V. Sokolovskaya, and S. N. Nikulin.
Gidrotekhnika i Melioratsiya, No 12, p 24-32, Dec 1970. 9 p, 9 fig.

Descriptors: *Irrigation practices, *Grasslands, *Pasture management, *Sprinkler irrigation, *Equipment, Irrigation water, Fertilizers, Farms wastes, Soil properties.
Identifiers: *USSR, Sprinklers, Liquid manure.

Basic factors to be considered in selecting irrigation methods for meadows and pastures include the surface-water source, field size, configuration and relief of fields, optimal size of corrals, obstacles impeding movement and relocation of equipment, a soil's water-physical properties and the composition of the grass stand. Before irrigating, a pasture must be marked off into strips, taking into account the layout of the irrigation network, operating width of the equipment, its variable output, etc. The economic effectiveness of meadow and pasture irrigation may be increased by applying fertilizers along with irrigation water. Application of one ton of liquid value to provide a yield increase of 50-80 feed units (equal in nutritional value to 50-80 kg of oats), which, when calculated for one hectare, will equal a yield increase of 1,000-2,000 feed units. Sprinklers and pumps under development in the USSR will provide for simultaneous application of liquid manure and irrigation water to crop rotation fields. Series production of two American-made sprinklers is contemplated following extensive testing in the Volga River region, Ukraine and Moscow Oblast. (Josefson-USGS)
W71-09132

IRRIGATION AND UTILIZATION OF IRRIGATED LANDS IN THE ASTRAKHAN' OBLAST (RUSSIAN: OROSHENIYE I ISPOL'ZOVANIYE OROSHAYEMYKH ZEMEL' V ASTRAKHANSKOY OBLASTI),
V. S. Bondarev, and V. Ye Viktorov.
Gidrotekhnika i Melioratsiya, No 12, p 18-23, Dec 1970. 6 p, 4 tab.

Descriptors: *Irrigation practices, *Irrigated land, *Crop production, Irrigated water, Sprinkler irrigation, Fertilizers, Farms wastes, Soils, Vegetable crops, Rice, Melons.
Identifiers: *USSR, *Astrakhan' Oblast, Sovkhozes, Kolkhozes, Sprinklers, Irrigation agriculture.

The natural economic conditions of the Astrakhan' Oblast are favorable for the cultivation of crops and have contributed for years to the development of irrigation agriculture. Although the crop lands under irrigation occupy only 25% of the entire sowing area, they provide 85-88% of total crop production. Recently, more than 42,000 ha of new irrigation land have been cropped, including 21,900 ha for rice crop rotations. A total of 935,000 ha of pasture land has been supplied with irrigation water. Of the total area of irrigation land (105,000 ha), 65,000 ha have an irrigation network. Sprinkler irrigation is becoming increasingly common on kolkhoz and sovkhoz lands of the oblast. The extent of agricultural lands under sprinkler irrigation has increased from 3,300 ha in 1963 to 49,700 ha in 1969. Practices employed at kolkhozes and sovkhozes have demonstrated the high economic effectiveness of fertilizer application. When 10-12 cntr of mineral fertilizers/ha were applied, the yield of unpolished rice increased by 15-20 cntr/ha,/ that of vegetables by 200-250 cntr/ha, and that of watermelons by 150-200 cntr/ha. (Josefson-USGS)
W71-09133

LAND RECLAMATION AND COMPLEX USE OF WATER RESOURCES (RUSSIAN: MELIORATSIYA ZEMEL' I KOMPLEKSNOYE ISPOL' ZOVANIYE VODNYKH RESURSOV),
For primary bibliographic entry see Field 04A.
W71-09134

A STUDY OF PRECIPITATION, STREAMFLOW, AND WATER USAGE ON THE UPPER RIO GRANDE,
Environmental Science Services Admin., El Paso, Tex.; and Bureau of Reclamation, El Paso, Tex.
For primary bibliographic entry see Field 02A.
W71-09310

ECONOMICS IN SOIL AND WATER CONSERVATION,
Iowa State Univ., Ames. Dept. of Economics.
John F. Timmons.
Agricultural Engineering, Vol 51, No 6, p 364-366, June 1970. 4 figures.

Descriptors: *Water, *Conservation, *Soil conservation, *Economic justification, Optimum development plans, *Planning.

This article discusses economic criteria for selection of soil and water practices for optimal use of public funds for conservation in the context of changing technologies. Although these new

technologies are increasing the range of practices for conserving soil and water resources, evaluation that will help maximize the satisfaction of consumer demands at the lowest per unit output cost over time remains an important and continuing challenge. (Holmes-Rutgers)
W71-09394

METEOROLOGY IN AGRICULTURAL PLANNING,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
Wolfgang Baier.
Canada Agriculture, Vol 16, No 4, p 30-32, Winter 1971. 3 fig, 1 tab.

Descriptors: *Climatology, Forecasting, *Model studies, *Soil water, Cost analysis, Crop production.
Identifiers: *Canada.

Canadian research in applied climatology has made it possible to classify existing and prospective agricultural areas, to estimate the potential production of crops, and to assess future economic benefits of specific farming systems. By combining the estimated variations of spring soil moisture and seasonal rainfall with results from field experiments on soil water usage and from economic surveys of production costs, it is possible to generate probable net returns for a variety of crops and management systems. (Holmes-Rutgers)
W71-09428

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

FIELD TESTS OF ICE PREVENTION TECHNIQUES,
Corps of Engineers, Anchorage, Alaska. Alaska District.
Julius H. Moor, and Carl R. Watson.
Proceedings of the American Society of Civil Engineers, Jouranl of the Hydraulics Division, Vol 97, No HY6, Paper 8179, p 777-789, June 1971. 13 p, 15 fig, 5 ref.

Descriptors: *Ice jams, *Flood control, *Ice breakup, *Rivers, *Alaska, Albedo, Hydraulics, River basin development, Melting, Ice, Freezing.
Identifiers: *River ice control.

The U.S. Army Corps of Engineers, Air Force, and the State of Alaska conducted a field research program in Alaskan rivers to find an economical and reliable technique for reducing ice jams and consequent flood frequencies. Procedures based upon principles described by previous researchere were: (a) Aerial dusting using fly ash which created a shear line along which the ice broke up more readily. (b) Pumping of river bottom materials onto the ice surface which decreased the albedo. (c) Cutting holes in the ice by blasting to utilize pressure flow of subsurface water produced by increased run-off of spring thaw to overflow parts of the ice cover with warmer river water. The costs in manpower, equipment, and materials are shown for each procedure. The results show that dusting through absorption of incident isolation will result in increased melt rates of snow and ice. Similar results were obtained with pumped river bottom materials. Pressure flow results will require further research, although the creation of holes in the ice of blasting or other mechanical means appears to be a positive method for creating a shear line which also offers open water to solar exposure and increased melting; however, blasting methods may kill or demand some aquatic organisms. (Cowgill-OWRR)
W71-08976

SIMULATION OF WATER YIELD FROM DEVEGETATED BASINS,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 03B.
W71-09001

FIELD COMPARISON OF SEVERAL TRENCH AND GRAVEL ENVELOPE DESIGNS,
Bureau of Reclamation, Sacramento; and California Univ., Davis.
D. A. DeBruyan, W. R. Jonston, and R. B. Duffin.
Paper 70-709, 1970 Winter Meet, American Society of Agricultural Engineers, Chicago, Ill, Dec 1970. 17 p, 4 fig, 4 tab, 10 ref.

Descriptors: Experimental data, *Experimental farms, Irrigation water, *Drainage engineering, Drainage systems, *Drain tiles, Gravels, Chemical analysis, Polymer concretes, Tile drainage, *Salt balance, Excess water (Soils), *Perched water table, Sand drains, Clay pipes, Concrete pipes, Plastic pipes, Performance, California.
Identifiers: San Joaquin Valley (Calif).

An 80-acre experimental plot was installed in the San Joaquin Valley of California to test the effects of varying design of several trench and gravel envelope placements on the effectiveness of tile drainage. Information collected from the experimental plot, and theoretical considerations of soil moisture tensions and trench geometry have led to the conclusion that the effectiveness of the gravel envelop depends largely upon the position of the gravel with respect to the tile drain and, to a minor extent, upon the effective trench perimeter. The quantity and position of the gravel placement may also influence peak discharge rates. Data will be gathered for approximately 5 additional years to evaluate more fully the various treatments with respect to water and salt movement and durability of pipe materials. (USBR)
W71-09054

DESIGN CRITERIA FOR IRRIGATION SYSTEMS WITH COMPLEX PIPE LOOPS,
Nebraska Univ, Lincoln.
D. M. Edwards, and B. Spencer.
Paper 70-723, 1970 Winter Meet, American Society of Agricultural Engineers, Chicago, Ill, Dec, 1970. 8 p, 4 fig, 1 tab, 7 ref.

Descriptors: *Pipelines, Design, Irrigation efficiency, Velocity, Head losses, *Irrigation systems, Computer applications, Water requirements, *Sprinkler irrigation, Water distribution (Applied), Water application rate, Water pressure, Topography.
Identifiers: *Hardy Cross method, Irrigation requirement.

New design analysis becomes necessary as irrigation systems become more complex. The analysis of a simple hydraulic system presents little difficulty, but when more complex systems are developed, the simpler procedure may fail to yield a solution. Uniform water application from irrigation systems on irregular topography such as golf courses, recreational areas, or specialized cropping areas deny simplicity in design. Such is also the case with multi-well fields and newly developed permanent solid set sprinkler, subsurface, trickle irrigation systems, and complex loop networks used in municipal water distribution systems. Upon adapting loop networks to irrigation systems, improved irrigation system design resulted. Loop networks can be solved using the Hardy Cross iterative technique. A procedure for designing irrigation systems involving pipe loop networks is presented. An iterative Hardy Cross analysis was used in the basic design procedure. The method can be programed on a digital computer. (USBR)
W71-09074

RAINFALL-RUNOFF-HYDROGRAPH RELATIONS FOR NORTHERN LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02A.
W71-09087

DETERMINATION OF CHANNEL CAPACITY OF THE FRESNO RIVER DOWNSTREAM FROM HIDDEN DAMSITE, MADERA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 08B.
W71-09092

SEEPAGE EFFECT ON CHANNEL BANK STABILITY,
Bureau of Reclamation, Denver, Colo. Hydraulics Machinery Branch; and Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Philip H. Burgi, and Susumu Karaki.
ASCE Proceedings, Journal of the Irrigation and Drainage Division, Vol 97, No IR-1, Paper 7968, p 59-72, Mar 1971. 14 p, 9 fig, 3 tab, 6 ref, append.

Descriptors: *Alluvial channels, *Seepage, *Bank stability, *Pore pressure, Erosion, Tractive forces, Scour, Erosion control, Hydraulic gradient, Groundwater movement, Open channel flow.
Identifiers: *Channel bank stability.

Canal side slope stability is related to groundwater hydraulic gradient, channel flow velocity and initial side slope angle. A quantitative, as well as qualitative, investigation of channel side slope stability is based on an experimental investigation of a trapezoidal channel in a laboratory flume. Various combinations of the variables were tested to determine the effect of seepage on channel side slope stability with various hydraulic and geometric conditions in the channel. An empirical relationship was developed for side slope seepage, expressing the erosion of the side slope as a function of hydraulic gradient and flow velocity in the channel. At relatively low velocities (less than 1 ft per sec) the erosion of the side slope is due primarily to the hydraulic gradient. At higher channel velocities, the side slope erosion is a function of channel flow velocity as well as the groundwater hydraulic gradient. (Knapp-USGS)
W71-09110

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN PENNSYLVANIA.
Corps of Engineers, Philadelphia, Pa. North Atlantic Div.

Army Corps of Engineers Water Resources Development Report, Jan 1971. 104 p, 1 fig, 1 map.

Descriptors: *Water resources development, *Pennsylvania, *Surface waters, *Projects, Reviews, Project planning, Flood control, Beach erosion, Navigation, Water supply, Bank stabilization.
Identifiers: *U.S. Army Corps of Engineers.

Current information on the scope and progress of water resources development within the Commonwealth of Pennsylvania by the U.S. Army Corps of Engineers is presented. The projects are concerned with navigation, flood control, beach erosion control, bank protection, and water supply. The Corps' role in planning and building these improvements is described, and the procedure for initiating and processing the improvements is explained. INFORMATION IS GIVEN ON THE STATUS OF THE VARIOUS PROJECTS, WHETHER THE WORK IS COMPLETED, IS UNDERWAY, OR HAS NOT BEEN STARTED. (Woodard-USGS)
W71-09112

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN THE DISTRICT OF COLUMBIA.
Corps of Engineers, Baltimore, Md. North Atlantic Division.

Army Corps of Engineers Water Resources Development Report, Jan 1971. 23 p, 1 fig, 1 plate, 7 photo.

escriptors: *Water resources development, *District of Columbia, *Surface waters, *Projects, eviews, Navigation, Flood control, Water supply, vers, Driftwood, Aquatic drift, Eutrophication, nd reclamation, Planning, Evaluation.
entifiers: *U. S. Army Corps of Engineers.

is report provides current information on the ope and progress of water resources development avigation, flood control, water supply, removal aquatic growth, drift removal, and land reclamaon) within the District of Columbia by the United ates Army Corps of Engineers. The Corps' role in nning and building these improvements and an planation of the procedure for initiating and ocessing them are described. Information is given the status of the various projects, whether the rk is completed, is underway, or has not been rted. (Woodard-USGS)
71-09113

OOD PLAIN INFORMATION ON DAYS EEK AND TRIBUTARIES AT TEXARKANA, KANSAS-TEXAS.
rps of Engineers, New Orleans, La.

my Corps of Engineers Flood Plain Report, July 70. 83 p, 29 fig, 52 plate, 17 tab.

scriptors: *Floods, *Flood damage, *Arkansas, exas, Flood plains, Regional flood, Flood ecasting, Flood control, Historic flood.
ntifiers: *Texarkana (Ark-Tex), Standard pro- t flood, Intermediate regional flood.

oding along Days Creek and major tributaries in vicinity of Texarkana, Arkansas-Texas, is cribed to aid in solving local flood problems and planning the best utilization of flood-prone ds. Maps, profiles, cross sections, and text terial relating the extent of past flooding to ods which might occur in the future are based on ilable records of rainfall, runoff, historical flood ghts and other technical data. The greatest flood record occurred in October 1926, when 9.29 hes of rain fell in a 24-hour period. Floodwaters ered many streets of the city and flooded many nes and business and public establishments in areas of the cities. (Woodard-USGS)
1-09114

OOD PLAIN INFORMATION-CAPE FEAR VER AND CROSS CREEK WATERSHED, YETTEVILLE, NORTH CAROLINA.
rps of Engineers, Wilmington, N.C.

ny Corps of Engineers Flood Plain Report, Sept 0. 81 p, 17 fig, 26 plate, 20 tab.

scriptors: *Floods, *Flood damage, *North olina, Flood plains, Regional flood, Flood ecasting, Flood control.
ntifiers: Fayetteville (N C), Standard project od, Intermediate regional flood, Historic flood.

oding along the Cape Fear River and in the ss Creek watershed in the vicinity of Fayetlle, North Carolina is described to aid in solving l flood problems and in planning the best zation of flood-prone lands. Maps, profiles, s sections, and test material relating the extent ast flooding to floods which might occur in the re are based on available records of rainfall, ru-, historical flood heights, and other technical . The greatest flood known at Fayetteville durthe past 82 years occurred in September 1945. vspapers pointed out the disastrous proportions he flood at Fayetteville, and leave no doubt that as the most damaging by far of any known to oldest residents at that time. The greatest wn flooding in the Cross Creek watershed oced due to the backwater effects of the river ng the 1945 flood. However, the backwater ding from the river during the 1945 flood was fined to the lower portion of the Cross Creek ershed. (Woodard-USGS)
1-09115

LONG-RANGE FORECASTING OF ICE BREAKUP ON RIVERS OF THE SEVERNYY KRAY (RUSSIAN: VSKRITIYE REK SEVERNOGO KRAYA I METODIKA YEGO DOLGOSROCHNOGO PROGNOZA),
For primary bibliographic entry see Field 02C.
W71-09126

CALCULATING RAINFALL RUNOFF LOSSES BY PRECIPITATION AND RUNOFF OF SMALL RIVERS USING THE DNIEPER RIVER-RECHITSA BASIN AS AN EXAMPLE (RUSSIAN: VYCHISLENIYE POTER' DOZHDEVOGO STOKA PO OSADKAM I STOKU MALYKH REK NA PRIMERE BASSEYNA R. DNEPRA DO G. RECHITSY),
For primary bibliographic entry see Field 02E.
W71-09128

CALCULATING MAXIMUM ICE JAM LEVELS OF THE NEVA RIVER (RUSSIAN: RASCHET MAKSIMAL'NYKH ZAZHORNYKH UROVNEY R. NEVY),
For primary bibliographic entry see Field 02C.
W71-09130

LAND RECLAMATION AND COMPLEX USE OF WATER RESOURCES (RUSSIAN: MELIORATSIYA ZEMEL' I KOMPLEKSNOYE ISPOL' ZOVANIYE VODNYKH RESURSOV),
A. V. Aleksankin.
Gidrotekhnika i Melioratsiya, No 12, p 9-17, Dec 1970. 9 p, 3 fig.

Descriptors: *Land reclamation, *Water resources development, *Soil management, *Planning, Climatic data, Streamflow, Runoff, Bogs, Saturated soils, Base flow, Drainage systems, Irrigation systems, Reservoirs, Ponds, Fish hatcheries, Erosion control.
Identifiers: *USSR, *Belorussia, Poles'ye.

As of January 1, 1970 about 1.6 million ha of land had been reclaimed in the Belorussian SSR with soil improvement methods applied to 800,000 ha. Analysis of the hydroclimatic characteristics of Belorussia for the period 1959-1965 showed that, except for 1962, there was a 15-20% decrease in normal streamflow for the area and as much as a 45-50% decrease in 1964 on rivers of the Poles'ye. In dry years runoff may not occur at all for 3-4 months on rivers with basin areas of 30-75 sq km. According to the Scientific Research Institute on Water Problems, USSR Ministry of Water Management, fluctuations in streamflow in the nonchernozem zone are basically the result of changes in climatic conditions. Reclamation of bogs and waterlogged soils of the area has a generally favorable effect on groundwater flow, especially on minimum and low flow, which are most important in the utilization of water resources of rivers. Plans are underway to expand construction of reservoirs, ponds, fish hatcheries, drainage and irrigation systems throughout the vast area of Belorussia. (Josefson-USGS)
W71-09134

STUDY OF THE RELATIONSHIP BETWEEN ANNUAL RUNOFF OF RIVERS OF THE USSR AND ATMOSPHERIC CIRCULATION (RUSSIAN: ISSLEDOVANIYE ZAVISIMOSTI GODOVOGO STOKA REK SSSR OT ATMOSFERNOY TSIRKULYATSII),
For primary bibliographic entry see Field 02A.
W71-09136

RIVER BED DEGRADATION,
Asian Inst. of Tech., Bangkok (Thailand).
For primary bibliographic entry see Field 08B.
W71-09149

IDENTIFICATION AND INTERRELATIONSHIPS OF SECONDARY BENEFITS IN WATERWAYS DEVELOPMENT,
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W71-09269

TALL WHEATGRASS BARRIERS FOR SOIL EROSION CONTROL AND WATER CONSERVATION,
Agricultural Research Service, Sidney, Mont. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 04D.
W71-09276

EVALUATING GEOLOGIC HAZARDS WITH MULTIBAND PHOTOGRAPHY,
San Francisco State Coll., Calif. Dept. of Geology.
For primary bibliographic entry see Field 07B.
W71-09304

ESTIMATING MEAN-ANNUAL RUNOFF USING CHANNEL EOMETRY MEASUREMENTS,
Geological Survey, Carson City, Nev.
Donald O. Moore.
Proceedings of 24th Annual Nevada Water Conference, Nevada Division of Water Resources and Nevada State Reclamation Association, Sept 24-25, 1970, Carson City, p 40-42, 1970. 3 p.

Descriptors: *Channel morphology, *Alluvial channels, *Stage-discharge relations, *Runoff forecasting, Stream gages, Gaging stations, Streamflow, Analytical techniques.
Identifiers: *Runoff estimation.

In Nevada, the Geological Survey is currently collecting records at 121 full-time gaging stations, 125 crest-stage gages, 10 low-flow partial-record stations, 13 lake and reservoir stations, and about 250 groundwater observation wells. It is often necessary to estimate the mean runoff in ungaged streams by transfer of data where streamflow records are available. But in many areas, particularly in the southwest, the transfer of data is difficult or impossible, and the mean runoff, therefore, has to be determined by other methods. A method of estimating the mean-annual runoff of ungaged streams uses stream-channel measurements. The method is based upon the assumption that channel dimensions adjust themselves to streamflow. Therefore, inspection and measurement of a stream channel should provide evidence of its mean-annual runoff. In developing the method, it was noted that the cross sections in perennial streams were deeper and more narrow than those in ephemeral streams. The ratio of width to depth in perennial streams, in the areas studied, averages about 20 to 1, whereas in the ephemeral streams, the width-depth ratio averaged about 50 to 1. Because of these differences, two sets of curves were developed to estimate the mean-annual runoff: one set for ephemeral streams, and the other for perennial streams. (Knapp-USGS)
W71-09313

PRELIMINARY REPORT ON WIND-TIDE FLOODING IN NEW HANOVER COUNTY, NORTH CAROLINA.
Corps of Engineers, Wilmington, N.C.

Army Corps of Engineers Flood Report, Dec 1969. 4 p, 11 plate.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: New Hanover County (NC), Standard project flood, Intermediate regional flood.

Wind-tide flooding of New Hanover County, North Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and

historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combination of these approaches. Wind tides affect the ocean front, the lagoon areas behind the barrier beach system, and the Cape Fear and Northeast (Cape Fear) Rivers. Fifty-four hurricanes have affected the New Hanover County coastline during the 20th century, and wind-tide stages have exceeded 5 feet mean sea level five times since 1954. (Woodard-USGS)
W71-09335

FLOOD PLAIN INFORMATION, WILLAMETTE RIVER, JOHNSON, KELLOGG, AND MT. SCOTT CREEKS, MILWAUKIE-OAK GROVE-LAKE OSWEGO, OREGON.
Corps of Engineers, Portland, Oreg.

Army Corps of Engineers Flood Plain Report, May 1970. 55 p, 6 fig, 24 plate, 17 tab.

Descriptors: *Floods, *Flood damage, *Oregon, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: *Willamette River (Oregon), Standard Project Flood, Intermediate Regional Flood.

Flooding of the Willamette River and tributaries, Milwaukie, Oak Grove, and Lake Oswego, Oregon, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The flood of December 1964 was produced by one of the most intense rainfall and snowmelt combinations that has occurred in the Pacific Northwest. Rainfall ranged from 6 to 10 inches over the entire Willamette Basin during the 4-day period, December 19-23. Had there been no upstream storage regulation, a catastrophe would have been experienced. Peak discharges in excess of 100 cubic feet per second per square mile were recorded at many gaging stations in western Oregon. (Woodard-USGS)
W71-09336

FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.
Corps of Engineers, Buffalo, N. Y.

Army Corps of Engineers Flood Plain Report, May 1970. 23 p, 28 fig, 12 plate, 3 tab.

Descriptors: *Floods, *Flood damage, *Ohio, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Huron River (Ohio), Flood records.

Flooding of the Huron River, Ohio, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The water stage recorder on the Huron River about 500 feet downstream of U. S. Highway 250, 0.25 mile northwest of Milan, Erie County, and two miles downstream of the confluence of the east and west branches was installed in 1950. The stage at the gage site in July 1969 (31.1 feet) was 7 feet higher than the stage for the January 1959 highwater occurrence (24.1 feet). The discharge in 1959 was 25,800 cfs and it has a recurrence interval in the order of once in 40 years. The 1969 flood has an estimated discharge of 48,900 cfs and it has a recurrence interval in the order of once in 125 years. (Woodard-USGS)
W71-09337

FLOOD PLAIN INFORMATION, QUACHITA RIVER, BAYOU LAFOURCHE AND TRIBUTARIES, MONROE, LOUISIANA.
Corps of Engineers, Vicksburg, Miss.

Corps of Engineers Flood Plain Report, June 1970. 57 p, 27 fig, 19 plate, 15 tab.

Descriptors: *Floods, *Flood plains, *Flood damage, *Louisiana, Historic flood, Regional flood, Flood forecasting, Design flood.
Identifiers: *Monroe (Louisiana), Ouachita Parish (La.), Standard Project Flood, Intermediate Regional Flood.

Flooding along the Ouachita River, Bayou LaFourche, Chauvin Bayou, and Youngs Bayou in Monroe, Louisiana, and vicinity is described in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The highest flood of record on the Ouachita River at Monroe in May 1958 with a stage of 50.45 feet (elevation 81.85). The greatest recorded flood on the Bayou LaFourche was in April 1947 with a stage of 28.7 feet (elevation 65.8) at Crew Lake, Louisiana. The Intermediate Regional Flood would be about 4 feet higher than the maximum flood at Monroe. (Woodard-USGS)
W71-09338

SPECIAL FLOOD HAZARD INFORMATION REPORT ON ECONLOCKHATCHEE RIVER, ORANGE AND SEMINOLE COUNTIES, FLORIDA.
Corps of Engineers, Jacksonville, Fla.

Corps of Engineers Flood Plain Report, June 1970. 3 p, 21 fig, 1 map.

Descriptors: *Floods, *Flood damage, *Florida, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: Orange County (Fla), Seminole County (Fla), Standard Project Flood, Intermediate Regional Flood.

Flooding of the Econlackhatchee River, Orange and Seminole Counties, Florida, is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occured and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The U.S. Geological Survey has maintained a stream gage on Econlockhatchee River at the State Highway 13 bridge near Chulota since 1935. The highest stage recorded at this gage was 20.8 feet during the March 1960 flood. The maximum discharge of record, 11,000 cfs, occurred during that same flood, which has an estimated frequency of once in 30 years. (Woodard-USGS)
W71-09339

FLOOD PLAIN INFORMATION, VERMILION RIVER, SKELLENGER CREEK, AND BONNEY CREEK, OHIO.
Corps of Engineers, Buffalo, N. Y.

Army Corps of Engineers Flood Plain Report, Ma
1970. 18 p, 16 fig, 14 plate, 3 tab.

Descriptors: *Floods, *Flood damage, *Ohio
Flood plains, Flood control, Non-structural alter
natives, Maximum probable flood, Historic flood.
Identifiers: Vermilion River (Ohio), Standard pro
ject flood, Intermediate regional flood.

Flooding of the Vermilion River, Ohio is describe
in a report of flood plain problems based o
records of rainfall, runoff, and historical an
present flood heights. Maps, photographs, profiles
and cross sections indicate the extent of floodin
that has occurred and which may be expected t
occur in the future. The information is for use i
study and planning ways to minimize vulnerabilit
to flood damages by control of flood plain use b
zoning and subdivision regulations, the construc
tion of flood protection works, or by combination
of these approaches. During the 1969 flood th
river reached its highest level, dating back to th
early 1900's. The Vermilion Lagoons area, locate
on the right bank and extending from the mout
upstream to Liberty Avenue, suffered the greates
damage. The storm began at about 7:00 p.m. o
Friday (July 4) and at 1:00 a.m. on Sunday the gag
at North Ridge Road recorded a peak of 17.1 fee
the maximum stage of record, and about 15 fee
above normal for that time. (Woodard-USGS)
W71-09340

**LEGAL ASPECTS OF WATER USE AND CON
TROL IN SOUTH CAROLINA. PART A
LEGAL CONSIDERATIONS RELATING TO
NEW WATER RESOURCES LAW FOR SOUT
CAROLINA,**
Clemson Univ., S.C. Water Resources Researc
Inst.
For primary bibliographic entry see Field 06E.
W71-09363

**LEGAL ASPECTS OF WATER USE AND CON
TROL IN SOUTH CAROLINA. PART B -
SOUTH CAROLINA LAKES AND PONDS:
STUDY OF PUBLIC AND PRIVATE RIGHT
THEREIN,**
Clemson Univ., S.C. Water Resources Researc
Inst.
For primary bibliographic entry see Field 06E.
W71-09364

**A FLOOD INSURANCE MODEL FOR SHARIN
THE COSTS OF FLOOD PROTECTION,**
Central Connecticut State Coll., New Britai
Dept. of Economics.
James C. Loughlin.
Water Resources Research, Vol. 7, No. 2, 3 table
1 figure, 12 references, p. 236-244 April 1971.

Descriptors: *Flood plain insurance, *Costs, *No
structural alternatives.
Identifiers: *1968 Flood Control Act, Flood I
surance Act.

The author states that there is an over reliance o
structural measures and insufficient consideratio
of nonstructural measures (zoning, land us
warnings, flood insurance, etc.). A flood insuran
program alerts the potential occupant of the risk
faces. Both types of measures, at a least cost co
bination, should be used. With the passage of th
National Flood Insurance Program in 1968, the
was an increase in the financial liability of the
sidents. It is a new way of finding optimal use of th
flood plain. (Campbell-Rutgers)
W71-09402

4B. Groundwater Management

**IDENTIFICATION OF IRRIGATION RETUR
WATER IN THE SUB-SURFACE, PHASE I
KAHUKU, OAHU AND KAHULUI AN
LAHAINA, MAUI,**
Hawaii Univ., Honolulu. Water Resourc
Research Center.

or primary bibliographic entry see Field 05B.
71-08972

EOLOGY AND GROUNDWATER
ESOURCES OF TRAILL COUNTY: PART 3
ROUNDWATER RESOURCES,
eological Survey, Bismark, N. Dak.
or primary bibliographic entry see Field 02F.
71-09090

ORTH ATLANTIC REGIONAL WATER
ESOURCES STUDY: APPENDIX D - GEOLO-
Y AND GROUND WATER (FINAL DRAFT),
eological Survey, Arlington, Va. and Geological
rvey, Hartford, Conn.
r primary bibliographic entry see Field 03B.
71-09106

LONG-RANGE FORECAST OF WATER
OW TO LARGE LAKES OF THE LADOGA
ASIN (RUSSIAN: DOLGOSROCHNYY PROG-
OZ PRITOKA VODY V KRUPNYYE OZERA
ADOZHSKOGO BASSEYNA),
3. Lyapunova.
Problems in Hydrological Forecasting (Voprosy
drologicheskikh prognozov), Gosudarstvennyy
dena Trudovogo Znameni Gidrologicheskiy In-
ut Trudy, No 179; Gidrometeoizdat, Leningrad,
9-116, 1970. 18 p, 6 fig, 3 tab, 6 ref.

scriptors: *Forecasting, *Flow, *Lakes, *Cli-
tic data, Air circulation, Navigation, Runoff,
ecipitation (Atmospheric), Atmospheric pres-
e.
ntifiers: *USSR, Lake Ladoga.

nethod of forecasting total flow of water to large
es of the Ladoga basin from December of one
ar through October of the next is based on a rela-
nship between anomalies of flow and anomalies
atmospheric circulation and on development of
nospheric circulation processes during the for-
tion of flow and the preceding period (May-Oc-
er of the first year). The reliability of the rela-
nship, which makes it possible to predict a given
w one year in advance, is 0.88. The results of
ng a prognostic relationship of total annual flow
antecedent atmospheric circulation are satisfac-
y for developing long-range forecasts of
nimum navigational levels for Lake Ladoga.
sefson-USGS)
71-09129

UNDWATERS OF THE MANGYSHLAK-UST
T OIL-AND GAS-BEARING REGION (RUS-
N: PODZEMNYYE VODY MANGYSHLAK-
TYURTSKOY NEFTEGAZONOSNOY
OVINTSII),
ademiya Nauk Kazakhskoi SSR, Alma-Ata. In-
ut Gidrogologii i Gidrofiziki.
S. Sydykov, B. Kukabayev, A. K. Kugeshev, A.
Vishnyakov, and G. V. Kulikov.
na-Ata, USSR, 'Nauka' Publishing House, 1970.
2 p, 26 fig, 45 tab, 145 ref.

scriptors: *Groundwater, *Water types,
eologic investigations, *Water yield, *Aquifers,
ter properties, Deserts, Geologic time, Geologic
mations, Topography, Hydrogeology, Climatic
a, Stratigraphy, Water supply, Brackish water,
sh water, Thermal water, Mineral water,
undwater recharge, Groundwater mining.
ntifiers: *USSR, *Kazakhstan, Mangyshlak
ninsula, Ust Urt Plateau, Zonality, Mineraliza-
n, Balneology.

e formation and distribution of groundwater in
vast desert regions of the Manygyshlak Penin-
a and Ust Urt Plateau are examined with par-
lar reference to depths of groundwater occur-
ce, groundwater yields and groundwater
drodynamic, hydrochemical and hydrothermal
ditions. Large natural resources of fresh and
ckish groundwater can be found in the aquifers
the region, particularly in Permian-Triassic,
wer Cretaceous, Miocene deposits and in sandy
massifs. Fresh waters can be effectively used for domestic consumption and for serving industrial projects in Southern Mangyshlak; brackish waters can be used for flooding pasture lands and for meeting domestic and industrial needs and, in some instances, for oasis irrigation. Extensive use can be made of mineral and thermal waters of the region, for example, for balneotherapy and for supply of heat. (Josefson-USGS)
W71-09135

A PRELIMINARY EVALUATION OF BANK STORAGE ASSOCIATED WITH LIBBY RESERVOIR IN NORTHWESTERN MONTANA,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 03B.
W71-09137

GROUNDWATER DATA AS OF 1967--COLORADO DESERT SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09142

SUMMARY OF THE GROUNDWATER DATA AS OF 1967--CALIFORNIA REGION,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02F.
W71-09143

GROUNDWATER DATA AS OF 1967--NORTH COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09144

GROUNDWATER DATA AS OF 1967--SOUTH LAHONTAN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09145

GROUNDWATER DATA AS OF 1967--NORTH LAHONTAN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09146

GROUNDWATER DATA AS OF 1967--SAN JOAQUIN BASIN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09147

GROUNDWATER DATA AS OF 1967--SACRAMENTO BASIN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09148

OBSERVATIONS ON WATER CONTENT CHANGES IN STRATIFIED SEDIMENTS DURING PIT RECHARGE,
Arizona Water Resources Research Center, Tucson.
L. G. Wilson.
Ground Water, Vol 9, No 3, p 29-40, May-June 1971. 11 p, 7 fig, 23 ref.

Descriptors: *Pit recharge, *Artifical recharge, *Unsaturated flow, *Water reuse, *Water level fluctuations, Hydrogeology, Hydrographs, Infiltration, Percolation, Water table, Water levels, Alluvium, Porous media, Soil water movement, Groundwater recharge.
Identifiers: Recharge testing.

Two pit recharge tests were conducted at an instrumented research site near Tucson, Arizona using cooling tower blowdown effluent from a nearby power plant. The first trial in 1966 consisted of 142 days of continuous inundation. The second test in 1968, comprised 15 wet-dry cycles with a total inundation time of 80 days. Qualities recharged by the two management techniques were contrasted. Water content profiles in 14 access wells clearly delineated two principal recharge mounds built above the water table within stratified materials in the 80 ft deep zone of aeration. During the continuous inundation test three stages were apparent in the history of the recharge mounds: growth stage, equilibrium stage and drainage stage. It was possible to relate these various stages to intake characteristics of the pit. (Knapp-USGS)
W71-09301

4C. Effects on Water of Man's Non-Water Activities

FOREST CUTTINGS RAISE TEMPERATURES OF SMALL STREAMS IN THE SOUTHERN APPALACHIANS,
Southeastern Forest Experiment Station, Franklin, N.C. Coweeta Hydrologic Lab.
Lloyd W. Swift, Jr., and James B. Messer.
Journal of Soil and Water Conservation, Vol 26, No 3, p 111-116, May-June 1971. 6 p, 2 fig, 2 tab, 22 ref.

Descriptors: Clear-cutting, *Water temperature, *Runoff, Small watersheds, Water conservation, Water quality, Vegatation effects, Thermal pollution, Fish, Trout, Water pollution sources.
Identifiers: Stream water temperatures.

Stream temperatures were measured during six forest-cutting treatments on small (23- to 70-acre) watersheds in the sourthern Appalachian Mountains. Where forest trees and all understory vegetation were completely cut maximum stream temperatures in summer increased from the normal 66 deg F to 73 deg or more. Some extreme treatments raised temperatures more than 12 deg above normal. Where steambank vegetation was uncut or had regrown, summer maximums remained unchanged or declined from temperatures measured under uncut mature hardwood forest. Increases in stream temperature were judged to degrade water quality and constitute thermal pollution because, after each clearcut, water temperatures exceeded optimum levels for trout habitat. (Knapp-USGS)
W71-09274

POLLUTION PROBLEMS IN THE 'OIL PATCH',
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-09303

PRELIMINARY EVALUATION OF THE HYDROLOGIC EFFECTS OF IMPLEMENTING WATER AND SEWERAGE PLANS, DADE COUNTY, FLORIDA,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 06D.
W71-09334

4D. Watershed Protection

SIMULATION OF WATER YIELD FROM DEVEGETATED BASINS,
Hydrocomp International, Palo Alto, Calif.
For primary bibliographic entry see Field 03B.
W71-09001

SEEPAGE EFFECT ON CHANNEL BANK STABILITY,
Bureau of Reclamation, Denver, Colo. Hydraulics Machinery Branch; and Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W71-09110

TALL WHEATGRASS BARRIERS FOR SOIL EROSION CONTROL AND WATER CONSERVATION,
Agricultural Research Service, Sidney, Mont. Soil and Water Conservation Research Div.
A. L. Black, and F. H. Siddoway.
Journal of Soil and Water Conservation, Vol 26, No 3, p 107-111, May-June 1971. 5 p, 4 fig, 3 tab, 7 ref.

Descriptors: *Erosion control, *Water conservation, *Windbreaks, *Wheatgrss, *Snow management, Water storage, Wind erosion, Shelterbelts, Soil conservation, Cover crops, Sediment control.
Identifiers: *Wind erosion control.

A perennial grass barrier system of conservation farming was evaluated for soil-water conservation and soil erosion control. Each barrier consisted of two rows of tall wheatgrass (Agropyron elongatum) seeded in 36-inch rows. Barriers were spaced 30 to 60 feet apart. By trapping snow, the continuous crop sequence with barriers stored 86 to 116% as much water as crop-fallow without barriers. At a height of 12 inches, windspeed from leeward of one barrier to windward of the next barrier increased from 17 to 70% of open field windspeed in the 30-foot barrier spacing and from 19 to 84% in the 60-foot interval. (Knapp-USGS)
W71-09276

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

TOXICITY OF SEA WATER TO COLIFORM BACTERIA,
Metcalf and Eddy, Boston, Mass.
Hugh P. Savage, and Bruce N. Hanes.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 854-861. 16 fig, 1 tab, 16 ref.

Descriptors: *Coliform, *Bioindicators, Saline water, *Toxicity, Light intensity, Temperature, Bacteriophages, Sedimentation, Adsorption, Biochemical oxygen demand, Nutrients, Bacteria, Sampling, Analytical techniques, Water quality control, *Pollutant identification, Water pollution effects.
Identifiers: *Bacterial density, Predators.

Investigations were conducted to establish whether or not the presence of coliform organisms in sea water provides a direct indication of recent fecal contamination. Samples taken in the ocean several miles offshore have been consistently devoid of coliforms, seemingly indicating that sea water has a toxic effect on coliforms. Samples of sea water were taken from an area relatively devoid of direct fecal contamination and mixed with raw sewage to yield desired BOD to volume ratios. BOD levels in flasks in conditions A, B, and C. were 0.6 to 1.8 mg/l, 9.9 to 20 mg/l, and 101 to 120 mg/l respectively. The conclusions obtained from this series of tests included: (1) somewhere between 1 and 10 mg/l BOD, fresh seawater temporarily loses its toxicity to total and fecal coliform bacteria; (2) in fresh seawater with BOD levels of 10 to 120 mg/l, a linear relationship seems to exist between the log of the maximum bacterial densities and the initial BOD; (3) the percentage of both fecal and total coliform bacteria contributing to the total population increased as maximum density was approached and declined as the populations declined; and (4) by themselves, total and fecal coliform bacteria are not reliable indicators of the degree of recent fecal pollution in seawater since, given sufficient nutrient levels, the bacterial density will increase. (Lowry-Texas)
W71-08946

ANALYSIS OF WATER FOR MOLECULAR HYDROGEN CYANIDE,
North American Rockwell Corp., Athens, Ga. Rocketdyne Div.
K. H. Nelson, and I. Lysyj.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 799-805. 4 fig, 2 tab, 8 ref. FWPCA Contact No 14-12-491.

Descriptors: *Toxicity, *Chemical wastes, Waste water (Pollution), Aquatic environments, Analytical techniques, Instrumentation, Water analysis, Gas chromatography, Polarographic analysis, Calibrations, Electric currents, Cathodes, Anodes, Temperature, Hydrogen ion concentration, Water quality, Pollutant identification.
Identifiers: *Hydrogen cyanide.

An analytical technique to measure concentrations of molecular hydrogen cyanide at levels of less than 100 parts per billion has been developed. The method used combines vapor phase equilibrium techniques with highly sensitive amperometric techniques to measure sparged HCN with a rotating gold anode by measuring current output of the system. Calibration of the system was accomplished using synthetic solutions of known composition. Synthetic unknowns were then tested, as well as fresh water from Sespe Creek in Ventura County, California. Synthetic samples of pH 6.1, 7-2, and 8.2 had standard deviations of 1.42, 2.59, and 3.12 respectively. The fresh creek water, to which known amounts of cyanides were added, had a pH of 8.2 and a standard deviation of 1.35. Current responses of a number of possible interferring ions were also measured. It was determined that H2S, in levels greater than the concentration level of HCN, could interfere with the readings. In concentrations below that of HCN, H2S was shown to have no effect on the readings. Present detection limits seemed to have been established by the techniques of handling and transferring nanogram quantities of the desired species. Therefore, improved handling techniques along should provide the prodecure with considerably more resolution. (Lowry-Texas)
W71-08952

A SIMPLE METHOD FOR THE BIOLOGICAL ASSESSMENT OF THE EFFECTS OF WASTE DISCHARGES ON AQUATIC BOTTOM-DWELLING ORGANISMS,
Virginia Polytechnic Inst., Blacksburg, Va.
John Cairns, Jr., and Kenneth L. Dickson.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 755-772. 7 fig, 3 tab, 41 ref.

Descriptors: *Statistical methods, *Mathematical models, Ecosystems, Sampling, Biological properties, Isolation, Analytical techniques, Microorganisms, Biological communities, Data processing, *Pollutant identification, Water pollution effects.
Identifiers: *Sequential Comparison Index, Redundancy expression, Confidence levels.

Biological methods of assessing pollutional damage are increasing in prominence with respect to physical and chemical methods. To facilitate the acceptance of biological monitoring, a complete program, including sampling, collection, isolation, preservation, identification, and data analysis, is presented. Sampling equipment includes multiple-plate artificial substrate samplers, bottom basket type artificial substrate samplers, grab samplers, surber square foot samplers, dredges, and nets. Data evaluation includes a comparison of species counted by both a biologist and a non-biologist, indicating that most bottom fauna organisms are fairly easily dividable into recognizable entities by non biologists. The Sequential Comparison Index (SCI) is introduced as a simplified method for estimating relative differences in biological diversity. The SCI is a rapid technique based on difference in shape, color, and size of the organisms collected. Confidence levels are established using a diversity index value obtained from collecting point data. This technique involves too much mathematical manipulation to be widely applied, but a computer program is also presented which will compute the diversity per individual, d, and the redundance expression, r. (Lowry-Texas)
W71-08954

CHEMICAL CHARACTERISTICS OF PRECIPITATION IN THE CHAMPLAIN VALLEY,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 02K.
W71-08973

CYCLE OF ORGANIC MATTER IN THE SEA,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05C.
W71-09021

LOW AMBIENT LEVEL UPTAKE OF 14C-DDT BY THREE SPECIES OF MARINE PHYTOPLANKTON,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
James L. Cox.
Bulletin of Environmental Contamination and Toxicology, Vol. 5, No. 3, p 218-221, 1970. 1 tab, 1 ref. NSF Grant No. 8408 and California Marine Research Commission, unspecified grant.

Descriptors: *DDT, *Pesticide residues, *Absorption, *Phytoplankton, *Analytical techniques, Chlorinated hydrocarbon pesticides, Pesticide kinetics, Bioassay, Laboratory tests, Pollutant identification, Water pollution sources.
Identifiers: Accumulation, Concentration, Syracosphaera sp., Thalassiosira sp., Amphidinium sp.

Because it was deemed desirable to determine partition coefficients of organisms for DDT residues at concentrations similar to those in the marine environment, an attempt was made to measure carbon-14-DDT uptake for three species of marine phytoplankton in pure culture. At equilibrium, 16 54% of the initially added C-14-DDT was removed from the water by the algal cells. True partition coefficients calculated using known volume percentages for the algal clones used in these experiments are 2.5 x 104 for Syracosphaera carterae and for Thalassiosira fluviatilus, and 8.0 x 104 for Amphidinium carteri. These values are equivalent to wet weight concentration factors. (LeGore Washington)
W71-09035

AERIAL PHOTOGRAPHY OF OIL SLICKS,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
Roger Worsley.
Field Studies Council, Oil Pollution Research Unit Orielton Field Centre, Annual Report, 1969, p 49-50.

Descriptors: *Oil, *Oily water, *Remote sensing, *Aerial photography, *Warning systems, Oil wastes, Water pollution sources, Pollutant identification, Pollution abatement.
Identifiers: *Oil pollution, *Oil spills, *Detection of pollution, Infra-red photography.

Infra-red color photography was investigated as a potential tool for early detection of marine oil spills. Details of techniques used are provided. The author concludes that the techniques are not suitable for routine use, which would entail specially loaded cameras on all existing air services, applicability in only bright sunlight, and use of critical important exposures and processing. Similarly

larization photography, though easier, is unsuita- e because the need for the aircraft to circle would quire substantial deviations from planned flight ths. Either method, however, would be useful in ergency situations. (LeGore-Washington)
71-09046

ENTIFICATION OF MS-222 RESIDUES IN LECTED FISH TISSUES BY THIN LAYER IROMATOGRAPHY,
reau of Sport Fisheries and Wildlife, Warm rings, Ga. Southeastern Fish Control Lab.
nn L. Allen, Charles W. Luhning, and Paul D. rman.
S. Fish and Wildlife Service, Bureau of Sport heries and Wildlife, Investigation in Fish Control ries, No 41, 1970. 7 p, 3 tab, 3 ref.

scriptors: *Analytical techniques, *Bioassay, hromatography, *Color reactions, Fish ysiology, Colorimetry, Laboratory tests, Path of llutants, Fish control agents, Fish farming, Fish ndling facilities, Fish management, *Pollutant ntification.
ntifiers: MS-222, *Anesthetics, Fish anesthetics, ugs, Thin-layer chromatography.

-222 (methanesulfonate of meta-aminobenzoic d ethyl ester) a commonly used fish anesthetic, cts with the Bratton-Marshall reagents to form a ue-red dye. Residues of MS-222 determined by reaction are not distinguished from other pri- ry aromatic amines. Thin layer chromatography used to identify MS-222 in the presence of ckground primary aromatic amine in fish muscle, in and blood. This method, in which the Brat- -Marshall reaction is used to visualize the spots, e both the specificity of the Bratton-Marshall ction for primary aromatic amines and the Rf of -222 as tools for identification of the residues. ce the meta-aminobenzoate ester can be ntified this should be a useful ancillary or con- natory method for determining the rate of disap- rance of drug residues in fish flesh and obtain- data for clearance and registration of the sthetic with the Food and Drug Administration. -Gore-Washington)
1-09048

RSISTENT PESTICIDES IN THE ENVIRON- NT,
hamsted Experimental Station, Harpenden gland).
primary bibliographic entry see Field 05B.
1-09088

SIDUES OF TOTAL MERCURY AND THYLMERCURIC SALTS IN LAKE TROUT A FUNCTION OF AGE,
nell Univ., Ithaca, N.Y. Pesticide Residue Lab.
primary bibliographic entry see Field 05C.
1-09104

MULTIPLE CORER FOR SAMPLING OFUNDAL BENTHOS,
eries Research Board of Canada, Winnipeg anitoba). Freshwater Inst.
drew L. Hamilton, William Burton, and John F. nnagan.
rnal Fisheries Research Board of Canada, Vol No 10, p 1867-1869, 1970. 2 fig, 3 ref.

criptors: *Sampling, *Profundal zone, nthos, Cores, Invertebrates, Stratigraphy, Sedi- ts.
ntifiers: *Multiple corer, Chironomid.

nterpreting the results of earlier studies of the roinvertebrates that live in lake sediments, the iencies of the samplers used have not been luated. Since recent efforts in aquatic biology e been directed toward such basic problems as duction and community energetics, the need for ntitative, or at least semiquantitative samplers, developed. A multiple corer for sampling the benthos of profundal sediments is described. It is relatively simple to construct and is light (approximately 17.5 lb (7.9 kg)) and easy to use. Since the area to be sampled is very small, several samples are needed. This corer is designed to take four core samples simultaneously, thus compensating for the small size of the individual core tubes. The samples from each core can, depending on circumstances, be analyzed separately or lumped together in a single sample. The sampler is well suited for use in small boats lacking power equipment. Trials reported elsewhere indicate that in soft sediments the samples taken are generally superior to those collected with most, if not all, of the more conventional samplers tested. (Jones-Wisconsin)
W71-09158

APPLICATION OF ASSOCIATION-ANALYSIS TO DISTRIBUTION STUDIES OF RECENT FORAMINIFERA,
Bedford Inst. Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
G. Vilks, E. H. Anthony, and W. T. Williams.
Canadian Journal of Earth Sciences, Vol 7, No 6, p 1462-1469, 1970. 4 fig, 3 tab, 6 ref.

Descriptors: *Analytical techniques, *Bioassay, *Marine microorganisms, Distribution, Environmental gradient, Animal groupings, Benthos, Ecological distribution, Ecosystems, Statistical methods.
Identifiers: *Foraminifera, *Association analysis, Canadian Arctic, Multivariate method, Marine ecology.

Important factors underlying an ecosystem may be revealed objectively through suitable analysis of interspecific associations of its biota. This objective assessment is valuable in surveys of remote areas such as marine benthos where visual examination is difficult if not impossible. Foraminifera are used for this analysis because of their ubiquitous distribution, large population, and large numbers of species readily identified. Counts of species from 75 samples of sediment from East Bay, Mackenzie King Island, in the Canadian Arctic were converted to a matrix of presence-absence data (56 species X 75 stations). These were submitted to both normal and inverse association-analysis as a preliminary test of the application of that multivariate method to problems in marine ecology. Results are compared with observations made at the time the survey was carried out. Although the pattern of sampling was not the most suitable for association-analysis, the results indicate that this analysis holds some promise of informative revelations about the Foraminifera environment. In experimental approaches to understand problems of marine ecology, the inverse form of association analysis may indicate groups of organisms particularly useful for comparative physiological ecology. (Jones-Wisconsin)
W71-09177

A COMPUTER BASED FLORISTIC ANALYSIS OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
Vincent J. Bellis.
Available from North Carolina Water Resources Research Institute, Raleigh, North Carolina 27607 - Price: $2.50. Available from National Technical Information Service as PB-200 262, $0.95 in microfiche. Report No 46, UNC-WRRI, North Carolina State University at Raleigh, Jan 1971. 28 p, 7 fig, 5 tab, 13 ref. OWRR Project A-044-NC (1).

Descriptors: *Phytoplankton, *Plant groupings, Computer programs, Numerical analysis, *Aquatic life, *Data processing, North Carolina.
Identifiers: *Pamlico River.

A computer based technique for analyzing distribution patterns among estuarine organisms was developed and tested on phytoplankton collections from Pamlico River. Jaccard's coefficient of similarity was used to generate a similarity matrix with final printout in dendrogram form showing clusters of collections having inherent similarity. Use of a similarity index based solely upon presence or absence of species within all possible pairs of collections (raw data) produced a dendrogram which described the seasonal periodicity of phytoplankton in the central Pamlico River. Computer programs developed in this project are written in Fortran IV and have been deposited in the program library of the East Carolina University Computer Center and can be obtained upon request from its director. (Howells-North Carolina)
W71-09211

MIGRATION AND METABOLISM IN A STREAM ECOSYSTEM,
North Carolina Univ., Chapel Hill. Dept. of Zoology; and North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
Charles A. S. Hall.
Available from UNC-WRRI, North Carolina State University, Raleigh, North Carolina, 27607 - Price: $2.50. Available from the National Technical Information Service as PB-200 264, $0.95 in microfiche. Report No 49, WRRI, The University of North Carolina, Feb 1971. 243 p, 52 fig, 33 tab, 120 ref, append. OWRR Project B-007-NC (3).

Descriptors: *Ecosystems, Aquatic environment, Aquatic habitat, Limnology, *Fish migration, *Standards, *Sampling, Water analysis, Migration, *Metabolism, North Carolina, Monitoring, Dissolved oxygen, Water quality, Productivity.
Identifiers: *Stream surveys, *Stream classification, New Hope Creek (N.C.).

Fish migration and total stream metabolism were monitored in New Hope Creek, N.C., from April, 1968 to June, 1970. Most of the 27 species had a consistent pattern of larger fish moving upstream and smaller fish moving downstream. In the spring of 1969, a daily average of 7 fish weighing a total of 1081 grams were caught moving upstream, and 17 fish, weighing a total of 472 grams, were caught moving downstream. The larger average size of the fish moving upstream resulted in a large transfer of fish mass upstream. Diurnal oxygen series were run to measure the metabolism of the aquatic community. Gross photosynthesis ranged from 0.21 to almost 9 g m-2 day-1 (g/m2/day), and community respiration from 0.4 to 13 g m-2 day-1 at the principal sampling station and both were highest in the spring. Area values of metabolism were similar for different parts of the stream, but both production per volume and respiration per volume were much larger near the headwaters than farther downstream. Migration may allow populations to take advantage of such differences in productivity by maintaining young fish in areas of high productivity. An energy diagram was drawn comparing energies of insolation, currents, photosynthesis, respiration, fish populations, and migrations. Parts of this model were simulated on an analog computer. Input energies from insolation and stream flow were similar. About 0.14 percent of the total respiration of the stream was from fish populations, and over one year about 0.01 percent of the total energy was used for the process of migration. The migration energy has an amplifying value of 14. Recommendations are included concerning sampling for dissolved oxygen and other aspects of water quality management.
W71-09213

RADIATION SURVEILLANCE - MONITORING THE ENVIRONS OF A NUCLEAR STATION,
Iowa-Illinois Gas and Electric Co.
L. C. Oyen.
Mechanical Engineering, Vol 92, No 8, p 32-37, Aug 1970.

Descriptors: *Radioisotopes, *Absorption, *Nuclear wastes, *Radioactive wastes, Food chains, Surface waters, Groundwater, Groundwater movement, Air pollution effects, Water pol-

lution effects, Strontium radioisotopes, Iodine radioisotopes, Fish, Milk, Mississippi River, Sediments, Water pollution sources.
Identifiers: Cesium radioisotopes.

The Quad-cities Nuclear Plant has a monitoring program that may serve as a prototype. Air, water, vegetation, soil, and key foods such as fish and milk will be surveyed periodically both off- and on-site in accordance with 'Federal Standards for Protection against Radiation.' Water and sediment at the plant intake and discharge canals to the Mississippi River is sampled continuously. Drinking water from on-site wells and from the four closest off-site wells, and Mississippi River water at the intake of downstream communities is sampled periodically. (Bopp-ORNL)
W71-09249

THE DEVELOPMENT OF A WIDE RANGE IMAGE SPECTRO PHOTOMETER INFORMATION SYSTEM,
TRW Systems Group Redondo Beach, Calif.
For primary bibliographic entry see Field 07B.
W71-09258

THE STUDY OF THE PHYSICAL, CHEMICAL AND BIOLOGICAL NATURE OF WATER QUALITY UNDER UTAH CONDITIONS,
Utah State Univ., Logan.
John M. Neuhold.
Available from the National Technical Information Service as PB-200 621, $3.00 in paper copy, $0.95 in microfiche. Utah State University Project Completion Report, June 1971. 57 p, 19 fig, 10 tab, 13 ref, append. OWRR Project A-003-Utah (14).

Descriptors: *Tertiary treatment, *Water pollution control, *Bibliographies, *Abstracts, *Municipal wastes, Water quality, Utah, Aquatic habitats, Bioindicators, Environment, Ecology, Fish, Dissolved oxygen, Sewage treatment.
Identifiers: *Logan River (Utah).

Domestic sewage effluent into a high mountain valley stream can produce a complexity of effects on receiving waters. Mountain streams are cold waters which have envolved a diverse biological system adapted to cold temperature, clear water and in which sewage effluents can persist for relatively long periods of time. The lower Logan River below the City of Logan is such a stream. It receives domestic effluent from the City of Logan, which at the start of the study went directly, untreated, into the Logan River, and during the course of the study was diverted through an extensive primary-secondary-tertiary treatment lagoon system returning treated water back to the receiving stream. The physical, chemical and biological qualities of the Logan River were studied before and after treatment. The development of a biological system and its effect on the physical and chemical qualities in the lagoon system, built essentially upon a primordial substrate, were also studied. An annotated bibliography of 250 references on waste water stabilization ponds is included. Tertiary treatment ponds can be ecologically managed to minimize organic build-up. Design criteria should also be established to maximize retention time to fully utilize the ecosystem developed in the pond. Free-form designs are suggested as a possible means to accomplish this with the added benefit of improving acsthetics of the system. (Knapp-USGS)
W71-09268

POLLUTION OF A MARINA AREA BY WATERCRAFT USE AS INDICATED BY COLIFORM AND CHEMICAL CONCENTRATIONS,
Michigan State Univ., East Lansing. Dept. of Microbiology; and Michigan State Univ., East Lansing. Inst. of Water Research.
For primary bibliographic entry see Field 05B.
W71-09270

FOREST CUTTINGS RAISE TEMPERATURES OF SMALL STREAMS IN THE SOUTHERN APPALACHIANS,
Southeastern Forest Experiment Station, Franklin, N.C. Coweeta Hydrologic Lab.
For primary bibliographic entry see Field 04C.
W71-09274

WATER ANALYSIS,
Geological Survey, Denver, Colo.
M. J. Fishman, and D. E. Erdmann.
Analytical Chemistry, Vol 43, No 5, p 356-388, April 1971. 33 p, 631 ref.

Descriptors: *Reviews, *Bibliographies, *Water analysis, *Chemical analysis, Solutes, Ions, Pesticides, Dissolved oxygen, Detergents, Organic matter, Radioisotopes, Stable isotopes, Trace elements.
Identifiers: Dissolved gases.

This review of the literature of analytical chemistry applied to water analysis covers a period from October 1968 through September 1970. The review includes a list of other reviews made in the period covered. Water analysis is subdivided into classes of constituents analyzed, and includes pesticides, oxygen, gases, detergents, organics, radioisotopes, stable isotopes, heavy metals, and mercury, as well as common and trace ionic solutes. A bibliography of 631 entries is divided into the same classes as the text. (Knapp-USGS)
W71-09289

MERCURY IN A COASTAL MARINE ENVIRONMENT,
Southampton Univ. (England).
J. D. Burton, and T. M. Leatherland.
Supported by Natural Environment Research Council. Nature, Vol 231, No 5303, p 440-442, June 18, 1971. 3p, 1 tab, 14 ref.

Descriptors: *Heavy metals, *Pollutant identification, *Poisons, *Estuaries, *Sea water, Path of pollutants, Water pollution sources, Bottom sediments, Water chemistry, Water analysis, Water quality.
Identifiers: *Mercury, *English Channel, Southampton water.

Mercury enters the oceans at comparable rates as a result of both human activities and continental weathering. The oceanic residence time of mercury is about 10,000 yr, so that human activities cannot yet have had a significant influence on the amounts of the element in the marine environment considered on a wide scale, whatever the effects on restricted environments. Some initial findings of investigations carried out in Southampton Water and the English Channel are discussed with these considerations in mind. Mercury in natural waters was determined spectrophotometrically with dithizone, after preliminary concentration and separation. Mercury in organisms and sediments was determined by neutron activation analysis of freeze-dried material. River Water entering Southampton in the Rivers Test and Itchen contained 0.010 micrograms/liter less than that in the estuary and the open water of the English Channel. The concentrations in whole Mercenaria, without shell, ranged from 0.18 to 0.57 p.p.m. dry weight (0.03 to 0.12 p.p.m. wet weight). Three samples from the surface of the bottom mud in different parts of the estuary had mercury contents ranging from 0.19 to 0.64 p.p.m. Two samples of mud from underlying anoxic layers, at depths of about 10 cm, contained 2.2 and 5.7 p.p.m. showing that pronounced enhancement can occur in reducing conditions. (Knapp-USGS)
W71-09293

ORIGIN OF PACIFIC OCEAN IRON-MANGANESE NODULES FROM RADIOISOTOPE DATA, (RUSSIAN: PROISKHOZHDENIYE ZHELEZO-MARGANTSEVYKH KONKRETSIY TIKHOGO OKEANA PO DANNYM O RADIOIZOTOPAKH),
Akademiya Nauk SSSR, Moscow. Geologicheski Institut.
V. V. Cherdyntsev, N. B. Kadyrov, and N. V. Novichkova.
Geokhimiya No 3, p 339-354, Mar 1971. 16 p, fig, 7 tab, 14 ref.

Descriptors: *Inorganic compounds, *Radioactive dating, *Radiochemical analysis, *Radioisotopes, Uranium radioisotopes, Histograms, Pumice, Mud, Diagenesis, Sea water, Geochemistry.
Identifiers: *USSR, *Pacific Ocean, Nodules, Thorium radioisotopes, Protactinium, Plutonium, Ionium, Sea muds, Isotopic composition.

The content of U-234, U-238, Th-232, Io (Th-230), RdTh (Th-228), Pa-231 and Pu-239 in more than 100 samples of iron-manganese nodules of the Pacific is examined. The nodules reveal very large fluctuations in Th:U ratios, which usually correlate with the ratios of Io: U-238 and Pa: U-235. No genetic relationship can be seen between the nodules, underlying muds and pumice. The uranium content in the volcanogenic nuclei of nodules is 10 times that in basalts of the Pacific Isles. The extremely high Th:U ratio in several of the samples and very low Io: U and Pa:U ratios in other nodules seem convincing proof of the volcanogenic origin of their radioisotopes. (Josefson-USGS)
W71-09306

A MODULAR CONTROLLED-TEMPERATURE APPARATUS FOR FISH EGG INCUBATION AND FRY REARING,
Federal Water Quality Administration, Duluth, Minn. National Water Quality Lab.
J. Howard McCormick, and Roll F. Syrett.
National Water Quality Laboratory, mimeographed report, Nov 1970. 18 p, 8 fig, 2 ref.

Descriptors: *Bioassay, *Toxicity, *Laboratory equipment, *Laboratory tests, Analytic techniques, Bioindicators, Pollutant identification, Water pollution effects, Facilities, Research facilities, Testing, Water quality, Juvenile fishes, Fry.
Identifiers: *Continuous-flow bioassay, Chronic pollution.

An apparatus is described for aquatic bioassay studies. The apparatus described is constructed on a modular basis and provides continuous flow of water at constant temperatures for experiments work with fish eggs and fry. Each module provides one test temperature, which is controlled with a thermoregulator and immersion heater in each headbox. Flow is regulated by headbox elevation and orifice size. (LeGore-Washington)
W71-09368

AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
Federal Water Quality Administration, Duluth, Minn; and Cincinnati Univ, Ohio, Dept. of Biological Science.
For primary bibliographic entry see Field 05C.
W71-09372

CARBAMATE BIOASSAY USING DAPHNIA MAGNA,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
Bruce L. Parker, James E. Dewey, and Carl A. Bache.
Journal of Economic Entomology, Vol 63, No 3, 710-714, June 1970. 3 tab, 17 ref.

Descriptors: *Carbamate pesticides, *Insecticide, *Bioindicators, *Bioassay, *Daphnia, *Analytic techniques, *Pollutant identification, *Laboratory tests, *Test procedures, Pesticide residues, Pesticide toxicity, Public health, Water pollution effects, Laboratory animals, Toxicity.
Identifiers: *Pesticide detection, Laboratory procedures.

bioassay for detection and determination of
nute quantities of carbamate insecticides in fruit
d vegetable crops was developed with Daphnia
agna. The Daphnia bioassay was quick, simple to
epare, reproducible, and proved more sensitive
carbamates than that for Drosophila
lanogaster. Crops were treated in the laboratory
d then extracted by a modification of the Nies-
n-Frehse method. The extracts of unknowns were
aporated, reconstituted with dimethyl sulfoxide,
d injected in 0.025 ml quantities into 13X100
n test tubes containing 2.5 ml of water. D. magna
cimens were introduced and toxicity observa-
ns were taken after 30 min. A standard curve
s prepared daily in reagent grade solvents; check
p extractions were seldom necessary. Recove-
s between 85-100% were consistently obtained.
-Gore-Washington)
1-09373

H-TOXICITY PROBLEMS OF PESTICIDES JAPAN - THE PRESENT SITUATION AND E POLICIES OF THE MINISTRY OF RICULTURE AND FORESTRY,
icultural Chemical Inspection Station, Tokyo
pan).
Hashimoto.
NS, Vol 15, No 3, p 325-329, Sept 1969.

criptors: *Bioassay, *Water pollution control,
gislation, *Permits, *Polutant identification,
views, *Agricultural chemicals, *Pesticides,
ernments, Water law, Bioindicators, Public
th, Laboratory animals, Laboratory tests, Tox-
, Aquatic environment, Water pollution
ces, Daphnia.
tifiers: *Japanese law, TL-m, Japan, Acute
ution, Chronic pollution.

ccount is provided of the policy of the Ministry
Agriculture and Forestry of Japan toward
rds of pesticides to aquatic organisms.
uirements of the Agricultural Chemicals Con-
Law, which provides for pesticide registration,
outlined, and labelling requirements and a
cide classification scheme are discussed. A
dard' method for the evaluation of acute tox-
of agricultural chemicals to fish, and a tenta-
method for the evaluation of acute toxicity of
cides to Daphnids are appended. (LeGore-
hington)
-09377

ASSESSMENT OF THE ASSIMILATION OF MENTAL PHOSPHOROUS BY NEWFOUN-ND MARINE ORGANISMS IN THE 1969 LUTION PROBLEM AND IN 1970 MONI-ING OPERATIONS,
ries Research Board of Canada, Halifax,
a Scotia). Halifax Lab.
Ackman, R. F. Addison, and J. Hingley.
nical Report No 208, 1970. 39 p, 3 fig, 18 tab,

riptors: *Phosphorous, *Absorption, *Marine
*Herrings, *Mortality, *Pollutant identifica-
*Fish diseases, *Fishkill, Inorganic com-
ds, Uptake (Biological), Chromatography,
r pollution effects, Water pollution, Path of
tants, Toxins, Salmon, Smelts, Invertebrates,
, Lobsters, Sculpins.
fiers: *Assimilation, Gas-liquid chromatog-
, Flatfish.

ts obtained are presented from the analysis
emental phosphorous of specimens of fish and
er marine organisms from Placentia Bay and
Harbour, Newfoundland. The analysis was by
quid chromatography. Dead herring from the
Placentia Bay in 1969 were found to contain
1200 ppb of elemental phosphorous in their
s. In 1970, living herring were observed to
n up to 42 ppb of elemental phosphorous in
viscera. Up to 59.5 ppb of phosphorous were
ed in the flesh of dead herring. (Katz-
ngton)
09384

WATER, WATER EVERYWHERE,
New York State Dept. of Environmental Conservation, Albany. Water Quality Surveillance Section.
Ronald E. Maylath.
The Conservationist, Vol. 25, No. 5, p. 14-17, April - May 1971, 36, 3 figures.

Descriptors: *Water quality control, *Monitoring, *Control systems, *Automatic control.
Identifiers: Mohawk River System.

This article describes the various components of the Water Quality Surveillance Network directed by the State of New York. Four primary types of surveillance are used in order to monitor New York State's water quality conditions: manual, automatic, aerial and public. The author maintains that this network can avoid unnecessary expenditures of large sums of money to correct hazardous situations which can be avoided if adequate surveillance is practiced. (Holmes-Rutgers)
W71-09412

5B. Sources of Pollution

IDENTIFICATION OF IRRIGATION RETURN WATER IN THE SUB-SURFACE, PHASE III: KAHUKU, OAHU AND KAHULUI AND LAHAINA, MAUI,
Hawaii Univ., Honolulu. Water Resources Research Center.
Pedro A. Tenorio, Reginald H. F. Young, Nathan C. Burbank, Jr., and L. Stephen Lau.
Available from the National Technical Information Service as PB-200 166, $3.00 in paper copy, $0.95 in microfiche. Technical Report 44, Dec 1970. 53 p, 36 fig, 11 ref, append. OWRR Project B-013-HI (1).

Descriptors: *Irrigation water, Groundwater, Nitrates, Dissolved solids, Hawaii, *Return flow, Water pollution sources, *Water reuse, Aquifers, Water quality, Pumping, Fertilization, Consumptive use.
Identifiers: *Irrigation return water.

The basal water quality of the Hawaiian Commercial and Sugar Company (HC and S) aquifer is most affected regionally, as well as locally, by the prevailing agricultural practices. The deterioration of the water is due in part to fertilization and to a greater extent to heavy pumping and recycling of the basal water. Water quality in the Pioneer Mill area parallels that of HC and S, although on a regional basis, the basal water quality, unlike that of the Pioneer Mill area, is not as deteriorated. Local effects of pumping are also especially noticeable in the Pioneer Mill area. Groundwater quality in the Kahuku area shows the obvious presence of irrigation return water indices, but, unlike the two plantations on Maui, the magnitude of the increases relative to uncontaminated water sources is considerably smaller. The effect of fertilization on Kahuku may be considered to be a principal factor in the regional distribution of index constituents with a relatively uniform nitrate distribution throughout. Local effects of pumping are quite pronounced and influence overall increases of indices, indicating that where heavy pumping takes place for irrigation, the increase in index constituents are correspondingly greater.
W71-08972

THE USE OF WATER AS A SAMPLING MEDIUM FOR TRITIUM OXIDE,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
D. McConnon.
Available from the National Technical Information Service as BNWL-CC547, $3.00 in paper copy, $0.95 in microfiche. Report BNWL-CC547, 1970. 13 p.

Descriptors: *Tritium, *Oxides, *Air, *Pollutants, *Sampling, Surfaces, Water pollution, Analytical techniques, Measurement, Indicators.

A sampling technique for airborne tritium oxide was developed and tested for 98 percent efficiency. The technique employs a gas wash bottle filled with ordinary distilled water through which air is bubbled at a constant flow rate. The method is rapid, reliable, and sensitive and has been proven under a variety of field conditions. Additionally, a technique is described for determining the amount of tritium oxide surface contamination. Because of difficulties in measuring the collection efficiency of the technique, it is presently used for qualitative measurements as a trend indicator. (Houser-NSIC)
W71-09003

MATHEMATICAL METHODS FOR EVALUATING THE TRANSPORT AND ACCUMULATION OF RADIONUCLIDES,
Battelle Memorial Inst., Columbus, Ohio.
S. G. Bloom, A. A. Levin, W. E. Martin, and G. E. Raines.
Available from the National Technical Information Service as BMI-171-30, $3.00 in paper copy, $0.95 in microfiche. Report BMI-171-30, Apr 3, 1970. 40 p, 1 fig, 14 ref. Contract AT (26-1)-171.

Descriptors: *Radioisotopes, *Absorption, *Food webs, *Nuclear explosions, Ecosystems, Human population, Water pollution, Radioactivity effects, Mathematical models, Drainage systems, Water pollution sources, Atlantic Ocean, Pacific Ocean, Canals, Runoff, Fallout.

In this study, a series of models has been used to identify the most important radionuclides and other factors affecting the calculation of potential radiation doses to man. The major kinds of food-web pathways are considered in an area large enough to include terrestrial, freshwater, and marine ecosystems; and to indicate the degree of ecological coupling between man and the environment, including food and water. To be conservative, a model is located within the watershed that has the highest fallout input and the lowest rate of radionuclide loss due to runoff; but the calculations for the aquatic compartments are based on the highest rate of runoff. For the marine ecosystem, the fallout input to seawater is maximized; the input from surface water is maximized; and the dilution due to dispersion and convection is minimized. Some differential equations for describing the biological transport are derived, and representative methods for obtaining the transfer coefficients are given. Analytical, finite-difference, and semianalytical methods for solving the differential equations are briefly described and a few methods are presented explicity with examples. (See also W71-09006) (Bopp-NSIC)
W71-09008

RADIOECOLOGICAL STUDIES ON THE COLUMBIA RIVER. PART I,
Battelle Northwest, Richland, Wash. Pacific Northwest Lab.
D. G. Watson, C. E. Cushing, C. C. Coutant, and W. L. Templeton.
Available from the National Technical Information Service as BNWL-1377, $3.00 in paper copy, $0.95 in microfiche. Report BNWL-1377, June 9, 1970. 46 p.

Descriptors: *Radioisotopes, *Absorption, *Biota, Zinc radioisotopes, Phosphorus radioisotopes, Runoff, Waste dilution, Water pollution control, Plankton, Periphyton, Seasonal, Radioecology, Water pollution sources.

The concentration of radionuclides which is found in natural waters and in biota is reduced by dilution from seasonal runoff. The increase in uptake by biota from the increase in metabolic activity in the spring is soon overwhelmed by runoff. Present data is similar to that collected prior to 1956 for beta, but not for gamma radiation levels. Shutdown of all reactors for several weeks dropped the level of most nuclides in the biota several orders of magnitude. The highest concentration factors were found in net plankton and periphyton for phosphorus-32 and zinc-65. (Bopp-NSIC)

W71-09017

PILGRIM NUCLEAR POWER STATION. PRELIMINARY SAFETY ANALYSIS REPORT, AMENDMENT 16.
Boston Edison Co., Mass.

Available from the National Technical Information Service as DOCKET-50293-31, $3.00 in paper copy, $0.95 in microfice. Report DOCKET-50293-31, Oct 2, 1970. 189 p.

Descriptors: *Water pollution control, *Nuclear power plants, *Potable water, *Biota, Sampling, Marine fish, Marine animals, Marine algae, Tritium, Iodine radioisotopes, Strontium radioisotopes, Zinc radioisotopes, Cobalt radioisotopes, Absorption, Water pollution sources.
Identifiers: Manganese radioisotopes, Cesium radioisotopes.

The surveillance program outside the station security fence includes the air, domestic and sea water, marine life, silt, milk, and crops. Water pumping stations which control water supply to most area residents are sampled and analyzed for gross beta and gamma biweekly, and for tritium and strontium monthly. Sea water intake and discharge canals are analyzed monthly for gross beta and gross gamma (with gamma spectrum analysis if the gross gamma increases), and tritium. Quarterly composites of the monthly samples are analyzed for manganese-54, zinc-65, cobalt-58, and cobalt-60. Fish, lobsters, and mollusks are sampled quarterly; Irish sea moss, during its harvest period. All marine life samples are taken from the vicinity of the discharge canal outfall and offshore current patterns and are analyzed for gross beta, gross gamma, strontium-90, cesium-137, manganese-54, cobalt-58, cobalt-60, zinc-65, and iodine-131. Equipment failures are analyzed with respect to release of radionuclides to the environment. (Bopp-NSIC)
W71-09018

FINAL REPORT OF OFF-SITE SURVEILLANCE FOR THE MILROW EVENT, OCTOBER 2, 1969.
Southwestern Radiological Health Lab. Las Vegas, Nev.

Available from the National Technical Information Service as SWRHL-95r, $3.00 in paper copy, $0.95 in microfiche. Report SWRHL-95r, June 1970, 22 p, 1 fig, 4 tab.

Descriptors: *Explosions, *Excavation, *Pollutants, *Water pollution control, *Water pollution sources, Envrionment, Environmental effects, Environmental engineering, Soil structure, Porosity, Porous media, Population, Geology, Alaska.

Amchitka Island, a member of the Aleutian Islands, was first used for an underground nuclear test in October 29, 1965. A second underground test, called the Milrow Event, was conducted by the Atomic Energy Commission at Amchitka on October 2, 1969. This report presents the operational procedures and results of the Public Health Service, Southwestern Radiological Health Laboratory off-site radiological safety and community information programs provided for Milrow. The off-site radiological safety program included operating environmental surveillance networks of air samplers, thermoluminescent dosimeters and gamma-rate recorders before and after the detonation, and fielding 13 radiation monitors for the detonation. All surveillance and monitoring results indicated no increase in radioactivity above background levels in the off-site area following the event. (Houser-NSIC)
W71-09027

HEATED EFFLUENT - AN ASSET TO AGRICULTURE,
Washington State Office of Nuclear Energy Development, Seattle.
For primary bibliographic entry see Field 05C.

W71-09028

TRITIUM IN NEW YORK STATE WATERS, 1965,
New York State Dept. of Health, Albany. Kurt Anderson Bureau of Radiological Health.
Kurt Anderson.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.50. Radiological Health Data and Reports, Vol. 10, No. 3, p. 93-97, 3 fig, 3 tab, 2 ref, March 1969.

Descriptors: *Tritium, *New York, *Rivers, *Lakes, *Sampling, Explosions, Fallout, Precipitation (Atmospheric), Surface runoff, Surface waters, Waste dilution, Water pollution sources.

The states major rivers, creeks, and lakes were sampled to see what variations in tritium content occurred throughout the state. Since most tritium in the atmosphere from nuclear weapons probably reaches the surface waters in precipitation, one would expect that running water, such as in creeks and rivers (made up of recent precipitation runoff) may be higher in tritium than large, deep lakes that contain older water, thus providing greater dilution (Houser-NSIC)
W71-09029

DISPOSAL OF RADIOACTIVE WASTE FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1969,
Naval Ship Systems Command, Washington, D.C. Nuclear Power Directorate.
J. J. Mangeno, and M. E. Miles.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402 Price $0.50. Radiological Health Data and Reports, Vol. 11, No. 8, p. 373-377, 3 tab, 9 ref, August 1970.

Descriptors: *Ships, *Radioactive waste disposal, *Water pollution sources, *Water pollution effects, Water pollution control, Monitoring, Oceans, Harbors, Naval architecture, Nuclear energy, Measurement, Discharge, Regulation, Sediments, Radioisotopes, Cobalt, Data collection.

This report summarizes data on disposal of radioactive wastes from U.S. Naval Nuclear-Powered Ships and their support facilities and summarizes results of environmental monitoring performed to confirm adequacy of waste disposal limits and procedures. The waste disposal data presented show that the total long-lived radioactivity in liquid waste discharges associated with operation and maintenance of naval nuclear-powered ships totaled 0.05 curies in 1969 for all harbors. This is comparable to the average of 0.2 curies discharged per year during the preceding 3 years for all harbors and is less than the average of 4 curies reported discharged per year during the preceding 5 years. Results of environmental surveys of harbor water and bottom sediment for gross radioactivity and for cobalt-60 (Houser-NSIC)
W71-09030

THE PERCH LAKE EVAPORATION STUDY - THE USE OF RADIOISOTOPES IN HYDROLOGY, FEBRUARY 1970, VIENNA, AUSTRIA.
Atomic Energy of Canada Ltd., Chalk River (Ontario).

Report AECL-3557, February 1970, CONF-700328-2, Paper SM-129/10 at IAEA Symposium on Uses of Isotopes in Hydrology, Vienna, March 9-13, 1970.

Descriptors: *Hydrologic Cycle, *Tracers, *Basins, *Lakes, *Tritium, Water vapor, Evaporation, Groundwater, Base flow, Model studies, Water pollution sources.

The primary purpose of the Perch Lake Project is to exploit the use of radioactive tracers in the study of all aspects of the hydrological cycle in a small, well-defined basin. Within this broad objective, a number of individual studies are being conducted, of which one, the use of tritiated water vapour for the study of evaporation mechanisms in a natural setting, is believed to be unique. Other studies include the determination of the water, tritiated water, energy, and trace-element budgets of the lake, of which the first three complement the use of tritiated water vapour to study basic evaporation mechanisms. Radioactive tracers have been used particularly for estimating the ground-water components of the water and tritium budgets. Groundwater flows predicted by the use of conventional hydrological techniques as well as various new models are being compared with the results obtained by using radioactive tracers. (Houser-NSIC)
W71-09032

TRITIUM INJECTION AND CONCENTRATION DISTRIBUTION IN THE ATMOSPHERE,
International Atomic Energy Agency, Vienna (Austria).
W. R. Schell, G. Sauzay, and B. R. Payne.
Journal of Geophysical Research, Vol. 75, No. 12, p. 2251-2266, April 20, 1970.

Descriptors: *Tritium, *Tracers, *Atmosphere, *Model studies, *Injection evaporation, Water vapor, Condensation, Meteorology, Parametric hydrology, Fallout, Precipitation (Atmospheric), Deuterium, Oxygen.

The use of environmental tritium as a water tracer has significantly increased our understanding of hydrological processes. Because of the large stratospheric reservoir of tritium produced by nuclear detonations and the relatively slow mixing rates between the stratosphere and the troposphere, studies of meteorological parameters of transport and diffusion can be made over many years. If the nuclear test ban treaty is observed and if no more large atmospheric nuclear detonations are conducted, the seasonal and annual changes in the atmospheric tritium distribution can give important information on the hydrological cycle and on meteorological effects. This paper relates stratospheric injection for a water tracer to the concentration of tracer in precipitation by means of meteorological parameters. A simplified model has been developed that relates injection, exchange evaporation, condensation of water vapor, and tritium to meteorological parameters in the troposphere. Since the form of the model is general, tritium, fallout radionuclide, deuterium, and oxygen 18 data can be used as tracers to test the basic assumptions and to examine the physical processes that are occurring. The model was tested with meteorological data and tritium concentrations in precitation from the IAEA/WMO World Network of sampling stations. The results of the initial application of the model to western Europe are presented. (Houser-NSIC)
W71-09033

TRITIUM GEOPHYSICS AS AN INTERNATIONAL RESEARCH PROJECT,
California Univ. San Diego, La Jolla.
H. E. Suess.
Science, Vol. 163, March 28, 1969, p. 1405-10.

Descriptors: *Geophysics, *Tritium, *Water vapor, *Tracers, *Precipitation (Atmospheric), *Oceans, *Runoff, *Surface water, Surveys, Ground water, Surface drainage, Economics, Meteorology, Water pollution sources.

Tritium is produced by cosmic ray on the order of 30 atoms per square centimeter of the earth's surface per minute. During 1961 and 1962 quantities of tritium greatly in excess of those naturally present were released artificially into the atmosphere by testing of hydrogen bombs. This amount can be estimated from the observed tritium content of precipitation and of the surface water of the oceans to be of the order of 105 grams. At this time all the water present on the surface of the earth, in the form of water vapor in the at

osphere, of cloud droplets, precipitation, and surce water is tagged with a measurable amount of itium. This situation affords us with a unique opportunity to study the behavior of water of our enronment in connection with many problems of eat scientific or economic importance. A proam has been initiated by the IAEA to make use of is opportunity. (Houser-NSIC)
71-09034

OW AMBIENT LEVEL UPTAKE OF 14C-DDT Y THREE SPECIES OF MARINE HYTOPLANKTON,
anford Univ., Pacific Grove, Calif. Hopkins arine Station.
r primary bibliographic entry see Field 05A.
71-09035

ERIAL PHOTOGRAPHY OF OIL SLICKS,
eld Studies Council, Pembroke (England). Oil llution Research Unit.
r primary bibliographic entry see Field 05A.
71-09046

EDIMENT, OUR GREATEST POLLUTANT,
gricultural Research Service, Oxford, Miss. Sedintation Lab.
R. Robinson.
per 70-701, 1970 Winter Meet, American ciety of Agricultural Engineers, Chicago, Ill, Dec 70. 15 p, 16 ref.

escriptors: *Sediments, Sediment production, ediment transport, Bibliographies, Deposition, llutants, *Water pollution, Erosion, Soil erosion, rbidity, Chemical properties, *Pesticide sidues, Solutions, Water resources, Fish conservtion, Eutrophication, Flood plains.
entifiers: Soil deposits.

diment becomes a pollutant when it occupies ter storage reservoirs, fills lakes and ponds, clogs eam channels, settles on productive lands, stroys aquatic habitat, and creates turbidity that tracts from recreational use of water. As a result, liment degrades water for consumptive or other es, increases water treatment costs, and damages ter distribution systems. Sediment is the carrier other pollutants such as plant nutrients, insectides, herbicides, and heavy metals. There is also dence that bacteria and virus are carried by sedients. Primarily, the larger sediment particles are st readily controlled by available technology; er particles are the principal carriers, more ac- chemically, and transported farther before position. Sediment is our greatest pollutant of ters in terms of volume, but in some instances, y actually remove and deposit pollutants from ution. In this case, sediment acts as a scavenger. SBR)
71-09055

SPERSION IN HETEROGENEOUS NONUFORM ANISOTROPIC POROUS MEDIA,
rdue Univ., Lafayette, Ind. School of Chemical gineering.
bert A. Greenkorn.
py available from GPO Sup Doc, $1.00; crofiche from NTIS as PB-200 258, $0.95. Enonmental Protection Agency, Water Pollution ntrol Research Series Report, September 1970. p, 28 fig, 8 tab, 28 ref, 3 append. EPA Grant 060 DLL (Formerly WP-101048-03).

escriptors: *Dispersion, *Porous media, *Soil ter movement, *Groundwater movement, *Path pollutants, Mixing, Anisotropy, Non-uniform w, Hydraulic models, Mathematical models, acers, Statistical models.
ntifiers: *Nonuniform anisotropic porous dia.

understanding of the dispersion phenomenon is cessary to predict flow of miscible fluids in nonmogeneous porous media. A literature review of dispersion in nonhomogeneous porous media was made and the continuum and statistical theories of flow in porous media were used with experiments in models of unconsolidated porous media to study the effects of heterogeneity, nonuniformity, and anisotropy on dispersion. Dispersion changes significantly with permeability. When models of different permeability are connected, the dispersive effect is not reciprocal. Dispersion changes significantly with nonuniformity. Likewise there is a significant effect when models of different nonuniformity are interconnected (second-order heterogeneity). Anisotropy was included in two kinds of models (linear and radial) by packing alternate layers of beads causing flow through these layers at different angles. The results have practical application, especially in tracing contaminants in surface and subsurface flow such as movement of pesticides, fertilizers, acid mine drainage, and feedlot waste through the soil. (Knapp-USGS)
W71-09079

PERSISTENT PESTICIDES IN THE ENVIRONMENT,
Rothamsted Experimental Station, Harpenden (England).
Clive A. Edwards.
Originally published as CRC Critical Review in Environmental Control, Vol 1, No 1, Feb 1970. (See W70-05057). Cleveland, Ohio, CRC Press (Division of Chemical Rubber Co), 1970. 78 p, 3 fig, 24 tab, 322 ref, append.

Descriptors: *Pesticide residues, *Hazards, *Pollutants, *Reviews, *Bibliographies, Fishkill, Pesticide kinetics, Distribution patterns, Path of pollutants, Pesticide toxicity, Pesticide removal, Public health, Water pollution sources, Pesticide drift, Water quality, Environment, Ecology.
Identifiers: Persistent pesticides.

Some of the more important pesticide residue surveys and experimental studies of residues in both the physical and biological sections of the environment are summarized in order to assess the present state of knowledge of the status of pesticide residues in the environment. Recent data are presented on the amounts of residues in all compartments of the environment to show how they are concentrated from the physical to the biological parts of the environment and into the upper trophic levels of food chains. The most difficult thing to assess from data currently available is not what the present situation is, but what changes will occur if certain actions, for example a ban on a particular pesticide, are taken. The cycling of pesticides in the environment is summarized to illustrate the movements of residues through the various compartments of the environment. A bibliography of 322 entries is included. (Knapp-USGS)
W71-09088

ENVIRONMENTAL MERCURY RESEARCH IN SWEDEN,
Swedish Environment Protection Board, Stockholm.
J. E. Larsson.
Swedish Environment Protection Board Report, June 1970. 44 p, 3 fig, 4 tab, 56 ref.

Descriptors: *Heavy metals, *Poisons, *Metal organic pesticides, *Water pollution effects, Pathology, Reviews, Path of pollutants, Public health, Bibliographies, Chemical wastes, Water pollution sources, Regulation, Human pathology, Food chains, Fallout, Fishkill, Toxicity, Water quality, Biochemistry, Bottom sediments.
Identifiers: *Mercury, *Methyl mercury, *Heavy metal poisons (Mercury).

The circumstances under which the mercury problem in Sweden was discovered are discussed, with a review of the research which was initiated as its consequence. Research outside Sweden is reported only when it has a direct influence on Swedish mercury research. The decisions of administrative authorities in the mercury field are reported with the effects of these decisions and measures. Comprehensive evidence documents the connection between the introduction of alkylmercury-containing seed disinfectants and increased content of mercury in the feathers and livers of birds, in particular birds of prey. In the water environment, extended investigations show increased mercury content of bottom sediment and fish in areas which are influenced by industrial pollution. Contaminated fish led to 'black listing' of several inland waters and some bays along the Swedish coast. Animal experiments show that methylmercury is metabolized slower than all other investigated mercury compounds. Experiments on animals show that methylmercury causes damage to the central nervous system and has an effect on hereditary mechanisms. Research in progress is mainly concentrated on the water environment. Mercury fallout is studied by sampling of air and precipitation and by analyses on lichens and mosses. Studies include the effects of methylmercury on behavior and learning, hereditary mechanisms, the detoxifying capacity of the liver, the metabolism of steroid hormones, and on the breeding results of fish. (Knapp-USGS)
W71-09089

HYDROLOGIC AND QUALITY CHARACTERISTICS OF THE LOWER MISSISSIPPI RIVER,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02E.
W71-09103

MERCURY--MAJOR NEW ENVIRONMENTAL PROBLEM,
New York State Dept. of Environmental Conservation, Albany. Bureau of Fish.
Carl E. Parker.
The Conservationist, August-September, p 6-9, 1970. 3 fig.

Descriptors: *Heavy metals, *Water pollution sources, *Public health, Human pathology, Fish, Standards, Great Lakes, Air pollution effects, Pesticides, Agriculture, Aquatic animals, Food chains, Sampling, New York.
Identifiers: *Mercury, Sweden, Toxic levels.

The present critical status of water pollution with mercury is reviewed. By the food-chain concentration, mercury of industrial wastes and pesticides attains extremely dangerous levels of toxicity in fish flesh. As shown by recent studies, mercury affects adversely the entire man's organism culminating in permanent brain damage; in several instances mercury-contaminated fish caused multiple deaths. The arbitrary tolerance levels in food vary at this time from 0.05 ppm, suggested by the World Health Organization/Food and Agriculture Organization, to 1.00 ppm, acceptable by Sweden. However, even the latter, highly questionably concentration will not permit either commercial or sport fishing in many water basins of the world. Analyses of water fowl and upland birds are likely to effect a drastic reduction of hunting. The solution of the mercury problem is hindered by the stubborn resistance of both industry and agriculture--a resistance pregnant with dire consequences. Thus far the burden of responsibility was on the Department of Fish and Wildlife, but in the future, mercury will be one of the major preoccupations of the new Department of Environment Conservation. (Wilde-Wisconsin)
W71-09164

BOMB CARBON-14 IN DEEP SEA ORGANISMS,
California Univ., San Diego; and Washington Univ., Seattle.
P. M. Williams, J. A. McGowan, and M. Stuiver.
Nature, Vol 227 (5256), p 375-376, 1970.

Descriptors: *Carbon radioisotopes, *Marine plants, *Phytoplankton, *Zooplankton, Food chains, Sea water, Vertical migration, Productivity,

Sampling, Crustaceans, Hawaii, Pacific Ocean, Fallout, Water pollution effects, Water pollution sources, Path of pollutant.

The input of C-14 to the atmosphere from nuclear weapons tests is reflected in the C-14 activity in surface seawater. Surface water Zooplankton, in equilibrium with surface C-14 levels, contain more C-14 than (bathypelagic) fish and crustaceans at lower levels. (Bopp-NSIC)
W71-09181

RADIOACTIVE POLLUTION OF RIVERS IN CZECHOSLOVAKIA,
Ustav Hygieny, Prague (Czechoslovakia).
Borivoj Havlik.
Health Physics, Vol. 19, p 617-624, Nov. 1970. 5 fig, 4 tab, 17 ref.

Descriptors: Water pollution effects, *Mining, *Uranium radioisotopes, *Radium radioisotopes, Potassium radioisotopes, Background radiation, Rivers, Streams, Absorption, Biota, Plankton, Aquatic plants, Sediments, Fallout, Water pollution control, Recirculated water, Water pollution sources, Mine drainage, Domestic water.

One of the oldest uranium mining areas in the world is the spa Jachymov in Bohemia. A study of environmental contamination began there when uranium mining was at a maximum, and continued until mining ceased 6 years later. Content of radium-226 and total beta activity of water, river sediments and water plants were estimated in the streams of this area and from the other uranium ore area, where mining reached its maximum during the study period. Radioactive pollution of the major Czechoslovak rivers during 1964-67 is described. (Bopp-NSIC)
W71-09183

STUDY OF THE PHYSICAL CHEMISTRY OF RUTHENIUM IN SEA WATER, (IN FRENCH),
Commissariat a l'Energie Atomique, La Hague (France).
Pierre Guegueniat.
Available from the National Technical Information Service as LEA-R-4125, $3.00 in paper copy, $0.95 in microfiche. Report CEA-R-4125, Dec. 1970. 22 p.

Descriptors: *Sea water, *Physicochemical properties, *Radioisotopes, Colloids, Solubility, Sediments, Water pollution effects, Nuclear wastes, Sedimentation, Absorption, Adsorption, Water pollution sources.
Identifiers: *Ruthenium radioisotopes.

The insoluble forms of ruthenium are sedimented, but soluble forms are carried away to the open sea. The importance of sediments in the contamination of marine organisms was shown in earlier experiments. The present chemical study shows that areas needing further work for clarification of ruthenium contamination are: (1) colloidal ruthenium compounds, (2) absorption on precipates formed when nuclear wastes are discharged into the ocean, (3) absorption by ocean sediments. (Bopp-NSIC)
W71-09184

PATHWAYS OF TRACE ELEMENTS IN ARCTIC LAKE ECOSYSTEMS. PROGRESS REPORT, APRIL 15, 1970-APRIL 14, 1971,
Alaska Univ., College. Inst. of Marine Sciences.
For primary bibliographic entry see Field 05C.
W71-09190

A COMPUTER BASED FLORISTIC ANALYSIS OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-09211

RADIOLOGICAL SURVEILLANCE STUDIES AT A BOILING-WATER NUCLEAR POWER REACTOR,
Environmental Health Service, Cincinnati, Ohio.
B. Kahn, R. L. Blanchard, and H. L. Krieger.
Availability: UNIPUB, Inc, PO Box 433, New York, NY. International Atomic Energy Agency, Symposium 146-26, p 537-548, New York, Aug 10-14, 1970. 19 p, 10 tab.

Descriptors: *Radioisotopes, *Effluents, *Environment, *Surface waters, *Radiation, *Nuclear power plants, Pollutants, Water pollution control, Water pollution sources, Water pollution treatment, Analytical techniques.

Radionuclides in water, gases, and airborne particles were measured at the Dresden Nuclear Power Station and in its environment in order to provide the technical basis for surveillance programmes at nuclear power stations. Concentrations of radionuclides in the primary coolant and the off-gas were determined on several occasions. At the same time, radioxenon concentrations and external radiation exposures were measured near the plume within 1-2 km of the stack, and the radionuclide content of effluent water was measured near the point of discharge. Samples of food, feed, and water from the immediate environment were also analyzed for specific radionuclides. Results of radionuclide analyses and radiation exposure calculations are presented. (Houser-NSIC)
W71-09235

ENVIRONMENTAL ASPECTS OF KARACHI NUCLEAR POWER PLANT,
Pakistan Atomic Energy Commission, Karachi.
M. Nasim.
Availability: UNIPUB, Inc, PO Box 433, New York, NY. International Atomic Energy Agency Symposium 146-51, p 781-789, New York, Aug 10-14, 1970. 10 p.

Descriptors: *Nuclear power plants, *Effluents, *Pollutants, *Path of pollutants, *Surface waters, Water pollution control, Water pollution sources, Radiation, Radioisotopes, Population, Food chains, Diets, Oceans.

To ensure that environmental dose limits for routine exposures are not exceeded, a program for the environmental survey of the site has been started. Environmental surveillance data would also be used as a basis for estimating population exposure. The program is basically directed at the identification of possible routes (exposure pathways) of contamination to the population. These include air and water pathways and fish and agricultural crops. (Houser-NSIC)
W71-09236

THE EFFECT OF URANIUM MINING AND MILLING ON POLLUTION OF RIVERS IN CZECHOSLOVAKIA,
Ustav Hygieny, Prague (Czechoslovakia).
B. Havlik.
Availability: B Havlik, Institute of Hygiene, Srobarova 28, Prague 10, Czechoslovakia. Health Physics, Vol 17, No 2, p 386-387 (Aug 1969).

Descriptors: *Water pollution, *Pollution abatement, *Water pollution control, *Water pollution sources, *Watersheds (Basins), *Surface waters, Mining, Radioactivity, Radioactivity effects, Radioisotopes.

A study of environmental contamination when the uranium mining was at a maximum and continued for 6 years, when mining ceased. These long term investigations enabled one to arrive at practical recommendations for protection of surface waters during all phases of mining activities. (Houser-NSIC)
W71-09237

DOSE ESTIMATION STUDIES RELATED TO PROPOSED CONSTRUCTION OF AN ATLANTIC-PACIFIC INTEROCEANIC CANAL WITH NUCLEAR EXPLOSIVES: PHASE III,
Oak Ridge National Lab., Tenn. Health Physics Div.
Stephen V. Kaye, and Paul S. Rohwer.
Availability: NTIS. ORNL-4579, Dec 1970. 145 p, 18 tab, 6 fig, 7 append.

Descriptors: *Canals, *Canal construction, *Canal Zone, *Atlantic Ocean, *Pacific Ocean, *Nuclear explosions, Pollutants, Water pollution, Soil contamination, Pollution abatement, Population, Radioecology, Radioactivity effects, Diets, Environmental effects, Environmental gradient.

This document is the final report covering contributions of the Health Physics Division of Oak Ridge National Laboratory (ORNL) to the Bioenvironmental Radiological Safety-Feasibility Study of a sea-level canal excavated with nuclear explosives. Potential doses to indigenous populations along Route 17 in eastern Panama and Route 25 in northwestern Colombia were estimated for a combination of hypothetical exposures to radiation. The studies attempted to determine when it might be appropriate for the evacuated populations to reenter areas adjacent to the two routes. The only modes of exposure considered were external exposure to a contaminated land surface and internal exposure from the ingestion of four types of contaminated foods and beverages. Parameters in the internal dose models were adjusted to differentiate five age groups within each of four indigenous populations and nine reference organs. These populations were further differentiated on the basis of diet and estimates of time- and age-dependent concentrations of radioactivity in dietary items. (Houser-NSIC)
W71-09238

THE BRITISH APPROACH TO ENVIRONMENTAL MONITORING,
United Kingdom Atomic Energy Authority, London (England). Authority Health and Safety Branch.
H. J. Dunster, A. W. Kenny, W. T. L. Neal, and A Preston.
Nuclear Safety, Vol 10, No 6, p 504-513 (Dec 1969).

Descriptors: *Environment, *Monitoring, *Regulation, *Radioactivity effects, Waste water pollution, Waste water disposal, Water pollution control, Water pollution sources, Nuclear reactors, Nuclear wastes, Effluents, Oceans.

Environmental monitoring forms an integral part of arrangements in Britain for controlling radiation exposure of the public. When detectable exposure to radiation occurs, the 'critical pathway' is used to establish the dose received by the 'critical' population group. When no increase in exposure can be detected, the simplest possible indication system is used to ensure that no significant change in the situation occurs. (Houser-NSIC)
W71-09240

RADIOECOLOGY OF CESIUM-137 AND STRONTIUM-90 IN A FOREST,
Institute of Public Health, Tokyo (Japan); Kiryu Coll. of Technology (Japan); and Japan Analytical Chemistry Research Inst., Tokyo.
Noboru Yamagata, Shunji Matsuda, and Morito Chiba.
Journal of Radiation Research (Tokyo), Vol 10, p 107-112 (Sept-Dec 1969). 2 fig, 7 tab, 3 ref.

Descriptors: *Strontium radioisotopes, *Coniferous forests, Absorption, Ecosystems, Food chains, Soil-water-plant relationships, Shrubs, Root zone, Fallout, Runoff, Water pollution sources.
Identifiers: *Cesium radioisotopes.

The highest concentration of both radionuclides was found in the fallen leaves and this can be

reasonably explained by the fact that the fallout rates were the highest three years ago. About 80% and 63% of the total deposition, respectively, of cesium-137 and strontium-90 were found in the upper 5 cm layer of soil; 18% and 23% in the vegetation, of which 11.4% and 10.7% were in fallen leaves. Uptake of strontium-90 by the pine tree and shrub roots was at least twice that of cesium-137. (Bopp-NSIC)
W71-09241

POLLUTION OF A MARINA AREA BY WATERCRAFT USE AS INDICATED BY COLIFORM AND CHEMICAL CONCENTRATIONS,
Michigan State Univ., East Lansing. Dept. of Microbiology; and Michigan State Univ., East Lansing. Inst. of Water Research.
W. N. Mack, and F. M. D'Itri.
Available from the National Technical Information Service as PB-200 622, $3.00 in paper copy, $0.95 in microfiche. Michigan State University Project Completion Report, May 1971. 15 p, 2 fig, 6 tab, 10 ref. OWRR Project A-038-MICH (1).

Descriptors: *Water pollution sources, *Bioindicators, *Coliforms, *Michigan, Marinas, Boats, Docks, Harbors, Inland waterways, Lake Michigan, Recreation, Boating, Water sports.
Identifiers: Watercraft pollution.

Samples of water from a marina area in Michigan used by watercraft were tested for the number of coliform organisms. There was a slight increase in the coliform most probable number of organisms in the slips most frequently used by the yachts. Outside sources of contamination probably added to the total number of organisms present in the area. Although an increase in the number of organisms was related to the presence of yachts in the marina, the concentration was far below the standard of total body contact as established by the Water Quality Standards for Michigan Intrastate Waters. Chemical analysis of water samples taken at the marina were all within the normal limits for the specific area. Other factors contributing to the presence of the coliform organisms in this relatively unpopulated area were considered. (Knapp-USGS)
W71-09270

PERSISTENCE OF PESTICIDES IN RIVER WATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
James W. Eichelberger, and James J. Lichtenberg.
Environmental Science and Technology, Vol 5, No 6, p 541-544, June 1971. 4 p, 2 tab, 11 ref.

Descriptors: *Persistence, *Pesticide kinetics, *Biodegradation, *Pesticide residues, *Chemical degradation, Chlorinated hydrocarbon pesticides, Rivers, Surface waters, Carbamate pesticides, Organophosphorus pesticides, Chemical analysis, Path of pollutants.
Identifiers: Pesticide persistence.

The persistence of 28 common pesticides in raw river water was studied over an eight-week period. Twelve organochlorine, nine organophosphorus, and seven carbamate pesticides were studied at a concentration of 10 micrograms/liter. No measureable degradation or chemical change was observed for the following organochlorine compounds: BHC, heptachlor epoxide, dieldrin, DDE, DDT, DDD, and endrin. Azodrin was the only organophosphorus compound that was stable throughout the study. All carbamate compounds were significantly changed after one week, and all but Baygon were completely lost after eight weeks. Where possible, the degradation or chemical conversion products of the pesticides were identified. (Knapp-USGS)
W71-09272

CHANGES IN THE CHEMICAL COMPOSITION OF SEDIMENTS OF LAKE WASHINGTON, 1958-1970,
Minnesota Univ., Minneapolis. Limnological Research Center; and Washington Univ., Seattle. Dept. of Zoology.
Joseph Shapiro, W. T. Edmondson, and David E. Allison.
Technical Report, 1971. 24 p, 1 tab, 22 ref. OWRR Project B-009-MINN (3).

Descriptors: *Water pollution effects, *Bottom sediments, *Eutrophication, *Water pollution control, *Washington, Phosphates, Nitrogen, Organic matter, Cores, Limnology, Nutrients, Water quality, Monitoring, Sampling, Data collections.
Identifiers: *Lake Washington.

Three cores were taken in deep water in different parts of Lake Washington in 1958 and 1959 and two cores were taken at one of the same locations in 1968 and 1970. During the interval between the two sets of cores, all the sewage effluent causing eutrophication of the lake was diverted, and the lake began to regress to a relatively unproductive condition. All the cores show higher concentrations of organic matter, phosphorus and nitrogen in the top few centimeters than deeper. Lake Washington is a particularly good subject for a study of this kind. Before 1963, as a result of continuing increases in sewage effluent entering it, the lake became more and more productive. Since 1963, as a result of a program of diversion of the effluents to Puget Sound, the lake has shown significant regression toward its earlier condition. Cores have been taken in a similiar fashion and in the same localities for about 12 years. (Knapp-USGS)
W71-09281

MERCURY IN A COASTAL MARINE ENVIRONMENT,
Southampton Univ. (England).
For primary bibliographic entry see Field 05A.
W71-09293

FORMATION OF METHYL MERCURY FROM PURE MERCURIC SULPHIDE IN AEROBIC ORGANIC SEDIMENT,
Swedish Water and Air Pollution Research Lab., Stockholm.
Torbjorn Fagerstrom, and Arne Jernelov.
Water Research, Vol 5, No 3, p 121-122, March 1971. 2 p, 1 fig, 3 ref.

Descriptors: *Heavy metals, *Poisons, *Sulfides, *Bottom sediments, *Metal organic pesticides, Path of pollutants, Water chemistry, Water pollution sources, Water pollution effects, Hydrogen sulfide, Chemical reactions, Water pollution control, Biochemistry.
Identifiers: *Mercury, *Methyl mercury.

The formation of methyl mercury from pure mercuric sulphide in aerobic organic sediments was studied. Methyl mercury is formed, but the speed of the methylation process is considerably lower compared to control series using inorganic divalent mercury. Periodic occurrence of hydrogen sulphide in bottom water and sediments is thus of importance for the turnover of mercury in an aquatic ecosystem. For restoring mercury-contaminated bodies of water the artificial binding of mercury as sulphide might be a possibility. At very high concentrations (over 500 ppm Hg) there is a decrease in the amount of methyl mercury formed due to the toxic effects of inorganic divalent mercury on the methylating organisms. In this situation mercury binding as mercuric sulphide might increase the methylation activity due to reduced toxicity. (Knapp-USGS)
W71-09296

WHERE DOES WATER QUALITY IMPROVEMENT BEGIN,
Agricultural Research Service, Beltsville, Md. Livestock Engineering and Farm Structures Research Branch.
Elmer E. Jones, Jr.
Ground Water, Vol 9, No 3, p 24-28, May-June 1971. 5 p, 5 fig, 10 ref.

Descriptors: *Groundwater movement, *Path of pollutants, *Water pollution sources, *Water wells, Malenclaves, Water sources, Domestic water, Well regulations.
Identifiers: Domestic well protection.

Most groundwater aquifers have a multibarrier natural defense system. With all these natural defenses, in most cases of contamination, the well itself is the path of entrance for the contamination. Only in very rare circumstances is it economically justified to substitute disinfection for adequate protection of a groundwater source. Rapid changes in well water quality with pumping time indicate less than optimum construction. Poorly constructed and abandoned wells serve as unauthorized and uncontrolled groundwater recharge points and have a degrading effect on groundwater quality. Water quality improvement should begin with excluding water of undesirable quality from the source of supply. For the home owner and farmer to profit from this ideal it must be accepted by well drillers, water conditioning dealers, and county and State healty departments. (Knapp-USGS)
W71-09300

FIELD STUDY OF SUBSURFACE SPENT SULFITE LIQUOR MOVEMENT USING EARTH RESISTIVITY MEASUREMENTS,
Research Council of Alberta, Edmonton. Earth Sciences Branch.
Douglas A. Hackbarth.
Groundwater, Vol 9, No 3, p 11-16, May-June 1971. 7 p, 2 fig, 7 tab.

Descriptors: *Path of pollutants, *Sulfite liquors, *Tracking techniques, *Electrical studies, *Seepage, Soil water movement, Groundwater movement, Geophysics, Tracers, Malenclaves, Waste disposal, Water pollution sources, Piezometers, Sampling, Water levels.
Identifiers: Earth resistivity studies.

A new method is presented for supplementing data from piezometers to monitor waste disposal sites. This method involves examination of a time sequence of resistivity measurements at fixed points in a disposal area. Spent sulfite liquor moving away from a seepage pit was traced by examining a grid of earth resistivity measurements made before and after dumping had taken place. The method appears to provide results which correlate with specific conducitivity of water samples from piezometers provided the following conditions are met: (1) highly conductive contaminant moving at shallow depth; (2) water table close to surface; (3) uniform soil and vegetative conditions; and (4) proper selection of electrode spacings. (Knapp-USGS)
W71-09302

POLLUTION PROBLEMS IN THE 'OIL PATCH',
Geological Survey, Denver, Colo.
John W. Rold.
American Association of Petroleum Geologists Bulletin, Vol 55, No 6, p 807-809, June 1971. 3 p, 1 fig, 2 ref.

Descriptors: *Water pollution sources, *Water pollution control, *Oil industry, *Oil fields, Injection wells, Oily water, Brines, Water wells, Monitoring, Path of pollutants.
Identifiers: Oil spills.

Throughout much of the 'oil path' water exemplifies the economic, sociologic, political, and ecologic lifeblood of the community. The permanent supply of usable water, on which the arid west depends for survival, faces many hazards. Currently, much available water exceeds or is rapidly approaching public health limits and the tolerance level of the inhtants. Oil field practices can and do pollute water, mainly by increasing total dissolved

solids (principally chlorides and sulfates), but also by releasing crude oil. Pollution may occur from several sources including evaporation pits, insufficient surface casing, abandoned wells, oil spills, and seismic shotholes. The solution of this problem requires a constant awareness of the value of fresh water, the habitat of groundwater, and the pollution potential of each operation. Constant planning, monitoring, and policing of the operation will not only prevent pollution, but will improve the industry's image and save oil companies money. (Knapp-USGS)
W71-09303

LAKE ERIE ALIVE BUT CHANGING,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
Dean E. Arnold.
The Conservationist, Vol. 25, No. 3, p. 23-30, Dec. - Jan 1970-71, 3 figures.

Descriptors: *Water pollution sources, *Pollution abatment, *Fisheries, Lake Erie.
Identifiers: Detroit River, Maumee River.

This article describes the problematic ecological situation into which Lake Erie has evolved, the causes of this condition, the effects of it and the possible solutions. The fisheries industry is a major focus of the article, suggesting ways for bringing it back to the lake as well as a detailed examination of what species of fish have been eliminated from Lake Erie and what new species have been introduced. The author concludes that 'if changes of some sort are not made in man's use and misuse of the Lake Erie resource, he will lose it entirely.' (Holmes-Rutgers)
W71-09409

STAGNANT SEA,
Goteborg Univ. (Sweden).
Stig H. Fonselius.
Environment, Vol. 12, No. 6, p 2-48 July/August 1970, 14 references.

Descriptors: *Water pollution sources, *International waters, *Economics, *Political aspects.
Identifiers: *Baltic Sea, International Council for Exploration of the Sea.

The Baltic Sea has been the object of scientific and economic interest for decades. It is an important trade waterway for seven countries in Northern Europe. This article describes the natural and man-made sources of pollution to the Baltic Sea and what the nations working together have already accomplished and plan to accomplish to control these pollutants. Although several 'fanciful suggestions,' as the author explains have been discussed, the political and economic aspects of any pollution control measures have to be carefully considered. (Holmes-Rutgers)
W71-09415

1969 FISH KILLS CAUSED BY POLLUTION (STATISTICAL REPORT).

For sale by the Superintendent of Documents, US Government Printing Office, Washington DC - Price $0.20. Federal Water Quality Administration, 1970. 20 p, 14 tab.

Descriptors: *Fishkill, *Water pollution effects, *Water pollution sources, Contamination (Water), Agricultural chemicals, Industrial wastes, Municipal wastes, Sewage effluents, Fertilizers, Mine wastes.

An estimated 41 million fish were killed by pollution in 1969, 15 million more than were killed in 1968. The Federal Water Quality Administration has compiled data on fish kills from every state except Hawaii, Nevada, North Dakota, Mississippi, and Maryland. Five general sources of pollution--agricultural operations, industrial operations, municipal operations, transportation operations, and other operations--are statistically related to the kills. The data is presented in the form of a data review, state kill report highlights, and fourteen fish kill tables. These tables depict an historical summary of kills, a summary of sources of pollution, a summary of kills by state, an analysis of types of water and seasonal incidence of kills, the severity of kills, and a cumulative listing of fish kills. (Kohla-Florida)
W71-09441

5C. Effects of Pollution

TOXICITY OF SEA WATER TO COLIFORM BACTERIA,
Metcalf and Eddy, Boston, Mass.
For primary bibliographic entry see Field 05A.
W71-08946

EFFECTS OF INCREASED TEMPERATURE ON COLD-WATER ORGANISMS,
National Marine Fisheries Service, Seattle, Wash.
George R. Snyder, and Theodore H. Blahm.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 890-899. 6 fig, 3 tab, 26 ref.

Descriptors: *Aquatic environments, *Thermal pollution, Hydroelectric plants, Nuclear power plants, *Temperature, Anadromous fish, Salmon, Trout, Fishkill, Mortality, Nitrogen, Saturation, Metabolism, Flow, Spawning, Fisheries, Pacific Northwest U. S., Water pollution effects.
Identifiers: *Thermal block.

Many investigations dealing with laboratory tests performed on cold water fishsubjected to warmer waters have been reported. The mortality of fish subjected to warmer water is an accepted phenomena, but the mechanisms, in many instances, are still unknown. Also, no significant data has been compiled under actual stream conditions. Many of the aquatic organisms of the Pacific Northwest have been demonstrated to have low tolerance to the temperature increases, and much actual field research is needed to define more clearly the thermal tolerance and survival of these organisms over a wide range of environmental conditions. Predictions have been made for a 16-fold increase in electric power generating plants in this region, and without adequate controls and knowledge, waste heat discharges may destroy, debilitate, or dislodge, portions of the aquatic biota. On the other hand, waste heat discharge have also been shown to be beneficial in some instances, although the benefits are more likely to accrue to saltwater habitats, especially man-made canals ponds, and raceways, than to natural freshwater habitats. Increased understanding of temperature effects may remove harmful side effects and provide increased benefits in other areas. (Lowry-Texas)
W71-08950

ANALYSIS OF WATER FOR MOLECULAR HYDROGEN CYANIDE,
North American Rockwell Corp., Athens, Ga. Rocketdyne Div.
For primary bibliographic entry see Field 05A.
W71-08952

NUTRIENTS AND NUTRIENT BUDGET IN THE BAY OF QUINTE, LAKE ONTARIO,
Ontario Water Resources Commission, Toronto.
M. G. Johnson, and G. E. Owen.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 836-853. 8 fig, 7 tab, 37 ref.

Descriptors: *Nutrients, *Nitrogen, *Phosphorus, Algae, *Eutrophication, Aquatic environments, Great Lakes, Bays, Watersheds (Basins), Surface drainage, Municipal wastes, Industrial wastes, Sampling, Water quality control, Cost analysis, Waste water treatment, Nutrient requirements.
Identifiers: Bay of Quinte, *Lake Ontario.

Algae blooms in the Bay of Quinte, Lake Ontario, have been increasing in severity and length over the past several years. Examination of aquatic life in the bay revealed an overwhelming predominance of organisms which readily function in organically rich waters. Input to the bay was monitored in 1968. During that time, the bay received 9.7 million lbs of nitrogen and 731,000 lbs of phosphates from all sources. Approximately 90% of the entering nitrogen entered via the rivers which empty into the bay, and these same rivers accounted for 60% of the phosphorus input. The remaining 10% of the nitrogen and 40% of the phosphorus was contributed from municipal-industrial sources. However, municipal-industrial flows are high strength low volume effluents which displace only a small volume of water from the lake. On the other hand, river flows are extremely low strength high volume additions to the bay which displace large volumes of water. Therefore, it was essential to consider the net additions of P and N rather than the total additions, the net addition being the amount of nutrient contained in an input which is in excess of the amount of nutrients contained in the volume of water displaced at the outlet. On this basis, 50% of the net nitrogen and 85% of the net phosphorus were contributed by municipal-industrial sources. Phosphorus removal from high concentration, low volume inputs, at a cost of $200,000 per year was recommended. (Lowry-Texas)
W71-08953

A SIMPLE METHOD FOR THE BIOLOGICAL ASSESSMENT OF THE EFFECTS OF WASTE DISCHARGES ON AQUATIC BOTTOM-DWELLING ORGANISMS,
Virginia Polytechnic Inst., Blacksburg, Va.
For primary bibliographic entry see Field 05A.
W71-08954

EFFECTS OF CADMIUM, ZINC, MANGANESE AND CALCIUM ON OXYGEN AND PHOSPHATE METABOLISM OF BLUEGILL LIVER MITROCHONDRIA,
Illinois Natural History Survey, Urbana, Ill.
Robert C. Hiltibran.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 818-823. 3 tab, 25 ref.

Descriptors: *Heavy metals, Fish, *Fish toxins, Chemical wastes, *Toxicity, Aquatic environments, Manganese, Oxygen, Calcium, Metabolism, Phosphates, Hydrolysis, Coagulation, Precipitation, Wildlife conservation, *Sunfishes.
Identifiers: *Mitochondria, Zinc, Cadmium.

Native wild bluegills were held in aerated aquaria, maintained at 25 deg C, for testing to determine the toxicity of various metal ions. Parameters monitored were the oxygen and phosphate uptake of the mitochondria. In the presence of succinic acid, oxygen uptake by the blue gill mitochondria was severely altered by: (1) 3.3 x 10-3 microns moles Cd ml of reaction medium; (2) 1.7 x 10-1 microns mole Ca/ml of reaction medium; and (3) 3.3 x 10-2 microns moles Zn/ml of reaction medium. In the presence of alpha-ketoglutaric acid, none of the metals had such a severe effect. However, 1.7 microns moles of Mn/ml of reaction medium inhibited oxygen uptake in the presence of both substrates. Cadmium and Zinc were found to increase the hydrolysis of adenosinetriphosphate by the mitochondria to a greater extent than either manganese or calcium. Previous investigators had speculated that deaths in fishes exposed to varying levels of lead, zinc, mercury, and copper were caused by coagulation or precipitation of mucus secreted by the gills, or damage to gill tissues. Research conducted here indicated that these effects may have been only secondary, and that the primary cause at death may be attributed to loss of energy production systems within the cells. (Lowry-Texas)
W71-08955

FISH TOLERANCE TO DISSOLVED NITROGEN,
New Mexico State Univ., University Park.

R. E. Speece, and W. E. Leyendecker.
New Mexico State University, Engineering Experiment Station, Technical Report, No 59, Nov 1969. 43 p, 7 fig, 11 tab, 7 ref, 2 append. OWRR Project A-018-NMEX (1).

Descriptors: *Fishkills, *Nitrogen, Pressure, *Trout, Saturation, Respiration, Aeration, Fish hatchery, Temperature, Chlorine, Dissolved oxygen, Oxygenation, Metabolism, Toxicity, Dininfection, Chromatography, Monitoring, Mixing, Fry, Water pollution effects, *Lethal limit.
Identifiers: *Goldfish, Dissolved nitrogen.

The tolerance to dissolved nitrogen of trout fingerlings and goldfish was compared in both pressurized and non-pressurized systems. The effect of the dissolved nitrogen on the rate of respiration of the fingerlings was also determined. Dissolved nitrogen concentrations as low as 100% of saturation caused trout fingerling mortality in the pressure system. This phenomenon was interesting since many well-aerated trout streams have 100% saturation concentrations of dissolved nitrogen. However, large numbers of bubbles were found on the specimens and the walls of the holding troughs, and it was speculalated that these bubbles were quite possibly the cause of the mortality. Both goldfish and trout lost equilibrium in the pressure system, but the goldfish floated and survived while trout died. Trout fingerlings were unable to tolerate 105% of dissolved nitrogen saturation for more than 4 1/2 days, while goldfish survived saturation concentrations of 140% for 48 hours, and 105% for 5 days. Goldfish in non-pressure systems were unaffected by saturations as high as 140% for 48 hours but in pressure systems, they lost equilibrium at 100% of dissolved nitrogen saturation in less than an hour. (Lowry-Texas)
W71-08960

EFFECT OF WATER TEMPERATURE ON NYMPHAL FEEDING RATE, EMERGENCE, AND ADULT LONGEVITY OF THE STONEFLY PTEROMARCYS DORSATA,
Environmental Protection Agency, Duluth, Minn. National Water Quality Lab.
Alan V. Nebeker.
Journal of the Kansas Entomological Society Vol 44, No 1, p 21-26, Jan 1971. EPA Program 18050 WAA 01/71.

Descriptors: *Water temperature, *Feeding rates, *Stoneflies, *Temperature, Water pollution effects, Insects, *Insect behavior, *Aquatic insects.
Identifiers: Pteronarcys dorsata.

The optimum and limiting temperatures for nymphal feeding, longevity of adults, number of eggs produced, and success of adult emergence were determined for the stonefly Pteronareys dorsata Newman (Pteronarcidae, Ptecoptera). The highest feeding rate occurred at 20C. No feeding occurred at 1C or 35C. The adults that emerged at 10C lived twice as long as those that emerged at 20C. None emerged at 5C or 25C. The best egg production occurred at 15C. The average adult life span was 17.5 days from nymphs reared at 20C, 31 days from nymphs held at 15C, and 36 days from larvae reared at 10C. (See also W71-08978) (Nebeker-EPA)
W71-08977

EFFECT OF TEMPERATURE AT DIFFERENT ALTITUDES ON THE EMERGENCE OF AQUATIC INSECTS FROM A SINGLE STREAM,
Environmental Protection Agency, Duluth, Minn. National Water Quality Lab.
Alan V. Nebeker.
Journal of the Kansas Entomological Society Vol 44, No 1, p 26-35, Jan 1971. EPA Program 18050--01/71.

Descriptors: *Water temperature, *Insect behavior, *Stoneflies, Seasonal distribution, Altitude, *Temperature, Water pollution effects, *Aquatic insects, Insects.
Identifiers: Plecoptera.

An analysis was made of the effects of temperature as influenced by altitude on the seasonal distribution and adult emergence of all winter stoneflies (Plecoptera) in a single stream. Water temperature of the stream, when modified by air temperature, solar insolation, snow cover, and springs produced significant changes in insect emergence patterns. (See also W71-08977) (Nebeker-EPA)
W71-08978

RADIOACTIVE DEBRIS FROM UNDERGROUND NUCLEAR EXPLOSIONS. 1. PHYSICAL AND CHEMICAL CHARACTERISTICS. 2. BIOLOGICAL AVAILABILITY OF THE RADIONUCLIDES TO AQUATIC ANIMALS,
California Univ., Berkeley. Lawrence Radiation Lab.
Florence L. Harrison.
Available from the National Technical Information Service as UCRL-50596, $3.00 in paper copy, $0.95 in microfiche. Report UCRL-50596, Feb 7, 1969. 28 p.

Descriptors: *Marine animals, *Radionuclides, *Nuclear explosions, Absorption, Aquatic animals, Particle size, Suspension, Adsorption, Metabolism, Aquaria, Water pollution effects, Zinc radioisotopes, Leaching.
Identifiers: Cerium radioisotopes, Cesium radioisotopes, Manganese radioisotopes, Ruthemium radioisotopes, Zirconium radioisotopes, Antimony radioisotopes.

Aquatic animals can become contaminated by uptake of dissolved radionuclides or by radionuclides present in small partices that have been taken up by the animals. Radioactive debris from the chimney area of two contained underground nuclear explosions was characterized as to particle size, radionuclide concentration, leachability, and uptake in edible parts of freshwater and marine animals. Leachability of the debris radionuclides was determined in distilled water, synthetic pond water, synthetic sea water, and 1 molar ammonium acetate. Uptake by reshwater animals was rapid with Ce, Mn, Ru, Zn, and Zr; slow with Co, Cs, and Sb. Uptake by marine animals was rapid with Ce, Cs, Mn, Ru, and Zr; slow with Co, Sb, and Zn. Since the animals were exposed to the radionuclides for only short periods of time (1-3 weeks), the equilibrium uptake was probably not attained. Uptake was higher by freshwater than marine animals for Zn-65, but lower for Cs-137. (Bopp-NSIC)
W71-09004

STUDIES ON ZINC IN FRESHWATER ECOSYSTEMS,
Oberlin Coll., Ohio.
Edward J. Kormondy.
Available from the National Technical Information Service as COO-1499-3, $3.00 in paper copy, $0.95 in microfiche. Report COO-1499-3, Jan 1969. 32 p. Contract AT (11-1)-1499.

Descriptors: *Zinc radioisotopes, *Aquatic insects, *Aquatic plants, Aquatic environment, Ecosystems, Aquatic habitats, Dragonflies, Algae, Sediments, Soil-Water-Plant relationships, Nuclear wastes, Absorption, Chelation, Metabolism, Aquaria, Water pollution effects, Adsorption.
Identifiers: *Zinc.

Zinc-65 is significantly concentrated in the aquatic environment from nuclear wastes. The present experiments with microcosms (dragonfly larvae, algae, water, and soil) show a dependence of uptake on temperature, volume of the aquarium and light; which suggests that metabolic activity plays a role. In particular, uptake by aquatic plants was affected by photosynthesis. Only about 1% as much uptake by plants occurred in the presence of the chelating agent EDTA. Preliminary studies showed variations in chelation by soil between various soil types. The binding of zinc by soil was reduced by the presence of plants. (Bopp-NSIC)
W71-09005

BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY STUDIES, ATLANTIC-PACIFIC INTEROCEANIC CANAL, BIBLIOGRAPHY,
Battelle Memorial Inst., Columbus, Ohio.
A. W. Rudolph, T. E. Carroll, R. S. Davidson, and A. E. Waller.
Available from the National Technical Information Service as BMI-171-41, $3.00 in paper copy, $0.95 in microfiche. Report BMI-171-41, June 30, 1970. 231 p.

Descriptors: *Bibliographies, *Nuclear explosions, *Environmental effects, Excavation, Canal construction, Radioactivity effects, Radioisotopes, Absorption, Food chain, Rain forests, Aquatic life, Marine animals, Marine fish, Crop production, Panama Canal.

This bibliographic compilation has been prepared in support of two related research programs: the bioenvironmental and radiological-safety feasibility studies, Atlantic-Pacific interoceanic canal; and the possible effects of a sea level canal on the marine ecology of the American Isthmian region. Some of the major topics are, broadly stated: human, agricultural, forest, freshwater and marine ecology; and hydrological transfer processes. Abstracts are of the indicative type, intended to describe the content with details. Index terms are listed immediately following the abstract. (See also W71-099007 thru W71-09010) (Bopp-ORNL)
W71-09006

BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY STUDIES, ATLANTIC-PACIFIC INTEROCEANIC CANAL, POSSIBLE EFFECTS OF A SEA-LEVEL CANAL ON THE MARINE ECOLOGY OF THE AMERICAN ISTHMIAN REGION, ABSTRACTS, THESAURUS,
Battelle Memorial Inst., Columbus, Ohio.
Thomas E. Carroll, and Ann W. Rudoph.
Available from the National Technical Information Service as BMI-171-25 and BMI-171-42, $3.00 each in paper copy, $0.95 each in microfiche. Abstracts, Report BMI-171-25, July 22, 1969. 275 p; Thesaurus, Report BMI-171-42, June 30, 1970. 129 p. Contract AT (26-1)-171.

Descriptors: *Marine fish, *Ecological distribution, *Canal Zone, Fish populations, Aquatic habitats, Marine fisheries, Oceanography, Tropical regions, Atlantic Ocean, Pacific Ocean, Canals, Ecology, Ecosystems, Mathematical models, Documentation, Abstracts.

These two reports consist of a compilation of 674 documents and a thesaurus, respectively. The compilation was made in support of the title research program, and an index to the abstracts was to be published as a third report. The major topics of the abstracts are: geological history of the isthmian region, flora and fauna of the eastern tropical Pacific and western Caribbean, physical and chemical oceanography of the isthmian region, present and potential fisheries, marine biology and ecology, mathematical modeling, distribution of species, life history information, and population dynamics. (See also W71-09006) (Bopp-NSIC)
W71-09007

MATHEMATICAL METHODS FOR EVALUATING THE TRANSPORT AND ACCUMULATION OF RADIONUCLIDES,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05B.
W71-09008

DARIEN FISH POLYCLAVE,
Battelle Memorial Inst., Columbus, Ohio.
J. A. Duke.
Available from the National Technical Information Service as BMI-171-34, $3.00 in paper copy, $0.95 in microfiche. Report BMI-171-34, Mar 12, 1970. 60 p. Contract AT (26-1)-171.

Descriptors: *Nuclear explosions, *Canals, *Marine fish, *Ecological distribution, Salinity, Turbidity, Resistance, Atlantic Ocean, Pacific Ocean, Feasibility studies, Information retrieval, Aquatic habitats.

An ecological study was conducted in connection with feasibility studies for the proposed sea-level canal. An information-retrieval system is presented for economically important fish species. It is predicted which species of fish are more likely to cross the canal and which are more likely to find a niche in the Atlantic. The species which show a wide range of tolerance of habitats, salinities, and turbidity are more likely to cross a canal. (See also W71-09006) (Bopp-NSIC)
W71-09009

DARIAN PHYTOSOCIOLOGICAL DICTIONARY,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 02I.
W71-09010

RADIONUCLIDE CYCLING IN AQUATIC ECOSYSTEMS,
Oak Ridge National Lab., Tenn.
Evelyn Brown, J. R. Gammon, and N. A. Griffith.
Available from the National Technical Information Service as ORNL-4446, $3.00 in paper copy, $0.95 in microfiche. Report ORNL-4446, p 113-136, July 1969.

Descriptors: *Radioisotopes, *Absorption, *Aquatic plants, *Aquatic animals, Lakes, Laboratory tests, On-site tests, Freshwater fish, Crayfish, Food webs, Cobalt radioisotopes, Strontium radioisotopes, Zinc radioisotopes, Potassium radioisotopes, Aerobic bacteria.
Identifiers: Tungsten radioisotopes, Cesium radioisotopes, Sulfur radioisotopes, Manganese radioisotopes.

Laboratory studies in conjunction with field work on White Oak Lake provided data for predictive models. The topics discussed include: pathway descriptions, turnover rates, uptake from various foods. Data are included on: uptake of W-181 from water by black bullheads and crayfish; cycling of Co-60, Cs-137, Mn-54, Sr-85, and Zn-65 in aquatic plants; uptake of Fe-59, W-181, and Zn-65 in the newt; the role of aerobic bacteria in the cycling of S-35; kinetics of Co-60, Cs-137, and K-42 in microcosms; and uptake of Cs-137 in seven species of fish. (See also W71-09012) (Bopp-ORNL)
W71-09011

HEALTH PHYSICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING JULY 31, 1969: SYSTEMS ECOLOGY, WATERSHED AQUATIC HABITAT INTERACTIONS.
Oak Ridge National Lab., Tenn.

Available from the National Technical Information Service as ORNL-4446, $3.00 in paper copy, $0.95 in microfiche. Report ORNL-4446, (p 137-162), July 1969.

Descriptors: *Ecology, *Mathematical models, *Watershed management, Geochemistry, Lakes, Coniferous forests, Algae, Insects, Phosphorus radioisotopes, Technology, Natural resources, Ecological distribution, Stochastic processes, Ecosystems, Aquatic habitats, Water pollution effects.

The purpose of the ecological systems analysis program is to develop a methodology for making useful predictions about the outcome of environmental interactions. Progress is reported on the following projects: pertience of recent ecological literature to the modeling of ecosystems, biogeochemical ecology research collection, parameter identification in systems ecology, numerical methods in systems ecology, a versatile compartment system simulation program, a stochastic model of feeding in a forest centipede, a model for cedar bog lake (Minnesota), analysis of the change-in-ratio model for estimating population abundance, and systems analysis of balsam forests. The Walker Branch watershed project was organized to assess the potential ecological impact of new technology being applied to the field of natural resource management. A compartment model is illustrated for evaluation of transfer rates and characteristics of the transfer functions among the principal components of the watershed ecosystem. A material balance study using P-32 and periphytic algae in a closed system in the laboratory was conducted to obtain data on uptake and turnover of phosphorus by stream diatoms. (See also W71-09011) (Bopp-NSIC)
W71-09012

RADIOLOGICAL PHYSICS DIVISION. ANNUAL REPORT, JULY 1968-JUNE 1969.
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05G.
W71-09013

COLUMBIA RIVER STUDIES. ANNUAL PROGRESS REPORT, 1968-1969,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05G.
W71-09014

COLORADO TROUT LAKE STUDIES (NEW STUDIES ON EXPERIMENTAL CONTAMINATION OF MARINE SPECIES BY CS-137, RU-106, AND CE-144),
Colorado State Dept. of Natural Resources, Fort Collins. Div. of Game, Fish and Parks.
C. A. Barnes.
Available from the National Technical Information Service as TID-25342, $3.00 in paper copy, $0.95 in microfiche. Report TID-25342, Jan 20, 1970. 12 p.

Descriptors: *Freshwater fish, *Fallout, *Food chains, Public health, Radioactivity effects, Water pollution effects, Fishing, Lake fisheries, Mountains, Alpine, Size.
Identifiers: *Cesium radioisotopes, Ruthenium radioisotopes, Cerium radioisotopes.

It is concluded that in the event of renewed contamination of the environment by radioactive fallout, the larger fish from montane and alpine lakes would present the greatest potential health hazard if caught and consumed by fisherman. Results of measurements of Cs-137 contamination of fish caught in three lakes are given. (Bopp-NSIC)
W71-09015

RADIOECOLOGICAL STUDIES ON THE COLUMBIA RIVER. PART I,
Battelle Northwest, Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05B.
W71-09017

STUDY OF THE MANGANESE CYCLE IN FRENCH WATERS AND IN BRINE USING MN-54,
Aix-Marseille Univ. (France).
D. Asselin-Bagarry.
Available from the National Technical Information Service as NP-18395, $3.00 in paper copy, $0.95 in microfiche. Report NP-18395, Jun 1970. 199 p.

Descriptors: *Radioisotopes, *Absorption, *Aquatic life, *Sediments, Water pollution effects, Cycling nutrients, Trace elements, Radioecology, Salinity, Aquatic plants, Fish, Mollusks, Water pollution sources.
Identifiers: *Manganese radioisotopes.

Stages of manganese-54 in the food web were studied including: uptake by sediments, uptake by plants taking root in the sediment, uptake by crustaceans eating the plants, and uptake by fish eating the plants. Uptake by two species of aquatic plants reached saturation in ten days. Concentration factors were 30,000 to 80,000. Desorption in pure water occurred in two stages with periods of 1.5 and 17.5 days. Uptake by fish reached saturation in 9 days in fresh water; in 13 days in saline water. The slower desorption period was 47 days in fresh water; 63 days in saline water. (Bopp-NSIC)
W71-09019

RADIATION EXPOSURE TO MAN FROM DISPOSAL OF TRITIATED WATER VAPOR TO THE ATMOSPHERE,
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
Jacques Planet, Guy Uzzan, and Jacques Le Grand.
Available from the National Technical Information Service as CEA-CONF-1560, $3.00 in paper copy, $0.95 in microfiche. Report CEA-CONF-1560, 1970. 25 p. (Presented at the 2nd Congress of the International Radiation Protection Association, Brighton, England).

Descriptors: *Human population, *Milk, *Tritium, Radioactivity effects, Absorption, Nuclear wastes, Air pollution effects, Water pollution sources, Water pollution effects, Food chains, Soil contamination, Precipitation (Atmospheric).

The dispersion of tritiated water in the physical environment (dispersion in air, rainwater contamination, and ground contamination) is examined. Both contamination by inhalation of tritiated water vapor and ingestion of foods (drinking water, vegetables, and animal products) are considered. The method is applied to a plant, 3 km from a village, discharging tritiated steam through a stack. The yearly dose as a function of age of individuals is estimated. The study showed that in certain cases the dose through ingestion of milk is appreciable for infants. (Bopp-NSIC)
W71-09020

CYCLE OF ORGANIC MATTER IN THE SEA,
Woods Hole Oceanographic Institution, Mass.
J. H. Ryther, and D. W. Menzel.
Available from the National Technical Information Service as NYO-3862-31, $3.00 in paper copy, $0.95 in microfiche. Report NYO-3862-31, May 1, 1970. 48 p.

Descriptors: *Phytoplankton, *Productivity, *Cycling nutrients, Trace elements, Nutrient requirements, Phytotoxicity, Decomposing organic matter, Sedimentation, Benthic fauna, Oceanography, Pollutant identification, Marine animals, Ecosystems, Food webs.

Cycling of organic matter through the marine ecosystem is being studied. Topics included are: the effect of growth-inhibiting or -stimulating trace elements on phytoplankton, loss of organic matter by excretion, effects of excretion and decomposition of plants and animals on nutrition of benthic fauna, and pathways of penetration of particulate organic matter to the sea floor. Analysis of data obtained on the first of two cruises is nearly complete. Publications are listed. (Bopp-ORNL)
W71-09021

ECOLOGY OF PODON POLYPHEMOIDES (CRUSTACEA, BRANCHIPODA) IN THE CHESAPEAKE BAY,
Johns Hopkins Univ. Baltimore, Md. Chesapeake Bay Inst.
H. F. Bosch, and W. R. Taylor.
Available from the National Technical Information Service as NYO-3497-23, $3.00 in paper copy, $0.95 in microfiche. Report NYO-3497-23, May 1970. 77 p.

escriptors: *Crustaceans, *Plankton, *Ecology, ributaries, Biorhythms, Period of growth, Size, radation, Verticle migration, Water pollution ef-cts.
entifiers: Chesapeake Bay.

his species appears in the plankton in shallow ibutaries during the spring, declines during the mmer, resurges in autumn, and disappears during nter. Overwintering eggs hatch prior to both ring and fall peaks. The mid-bay population at-ins greatest densities within 11-26C, 8-18% linity, and greater than 2 ml/l of oxygen. Concen-ations are situated in the upper layers during the y, and in deeper water at night. (Bopp-ORNL)
71-09022

BLIOGRAPHIC DISCUSSION ON THE HYSICO-CHEMICAL BEHAVIOR AND THE ADIOECOLOGY IN HYDROBIOLOGICAL 'STEMS OF CERIUM AND OTHER LANTHA-DES, (IN FRENCH),
ommissariat a l'Energie Atomique, Fontenay-x-Roses (France).
obert Bittel.
vailable from the Nationl Technical Information rvice as CEA-Bib-138, $3.00 in paper copy, .95 in microfiche. Report CEA-Bib-138, May 69. 88 p.

escriptors: *Hydrologic properties, *Biological operties, *Physicochemical properties, Chela-n, Chemical reactions, Soil chemical properties, ater pollution effects, Radioecology, Effluents.
entifiers: *Lanthanides, Rare earths, Cerium dioisotopes, Promethium radioisotopes, Europi-radioisotopes.

ncerns lanthanides with a long or medium half e (cerium, promethium, and europium); com-exes of these elements with compounds present effluents and contaminated aqueous environ-nts; analytical techniques used in radio- and cer chemistry; and behavior of rare earths (prin-ally cerium) in soils. (Bopp-NSIC)
71-09023

CCUMULATION OF RADIONUCLIDES IN SH, (IN GERMAN),
atliche Zentrale fuer Strahlenschutz, Berlin ast Germany).
Ettenhuber.
ailable from the National Technical Information rvice as SZS-7/70, $3.00 in paper copy, $0.95 in crofiche. Report SZS-7/70, Apr 1970. 30 p.

scriptors: *Radioisotopes, *Absorption, *Fish, blic health, Water pollution effects, Environ-ntal effects, Bibliographies, Reviews.

e effect of environmental parameters on uptake radionuclides by fish is reviewed briefly and blic health aspects are considered. Concentra-n factors are tabulated for uptake of a number of lionuclides by different species of fish. (Bopp-IC)
71-09024

PRELIMINARY BIBLIOGRAPHY OF ATHEMATICAL MODELING IN ECOLOGY,
k Ridge National Lab., Tenn.
V. O'Neill, J. M. Hett, and N. F. Sollins.
ailable from the National Technical Information rvice as ORNL-IBP-70-3, $3.00 in paper copy, 95 in microfiche. Report ORNL-IBP-70-3, Oct 70, 97 p.

scriptors: *Mathematical models, *Bibliogra-es, *Ecology, Documentation, Ecosystems, Pri-ry productivity, Plant populations, Dominant or-isms, Plant growth substances, Ecological dis-ution, Systematics, Secondary productivity, imal populations, Decomposing organic matter, osystem, Aquatic environment, Cycling rients, Drainage, Soil-water-plant relationships, ciation, Information retrieval, Simulation anal-, Optimization.

The techniques of mathematical modeling are expected to play a major role in the synthesis of data from the Deciduous Forest Biome Project. It was necessary to limit the scope of the bibliography in order to make it available as early in the program as possible. No attempt was made to review developments in systems analysis which have been reported in engineering or operations research journals. Also, no attempt was made to present the many kenetics models found in the physiological literature. Finally, the literature on the applications of statistics in ecology has been reviewed recently (Schultz, 1961) and these citations have been omitted. Instructions for preparing citations in a standard punch-card format are given in an appendix. (Bopp-NSIC)
W71-09025

AN INTRODUCTION TO THE NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS IN ECOSYSTEM MODELS,
Oak Ridge National Lab., Tenn.
R. V. O'Neill.
Available from the National Technical Information Service as ORNL-IBP-70-4, $3.00 in paper copy, $0.95 in microfiche. ORNL-IBP-70-4, Dec. 1970. 29 p, 1 fig, 9 tab, 9 ref.

Descriptors: *Mathematical models, *Ecology, *Numerical analysis, Linear programming, Approximation method, Energy equation, Regression analysis.
Identifiers: Differential equations.

Four of the available numerical solution methods for differential equations are evaluated relative to their potential use in ecosystem models. A simplified energy flow model is used as an example. The Runge-Kutta method consistently emerged as reliable and efficient. Although the Euler method is simple, the user should be aware of the potential pitfalls which are associated with it. Use of a variable rather than a fixed value of the calculation interval h can greatly increase efficiency, and derivation of methods specifically designed for a particular problem can improve accuracy. Such refinements will be discussed in a future publication. (Bopp-NSIC)
W71-09026

HEATED EFFLUENT - AN ASSET TO AGRICULTURE,
Washington State Office of Nuclear Energy Development, Seattle.
L. B. Bradley.
Power Engineering, Vol. 73, No. 3, p. 52-62, March 1969.

Descriptors: *Beneficial use, *Thermal pollution, *Power plants, *State governments, *Water resources development, Planning, Agriculture, Effluent irrigation water, Economic feasibility, Columbia River, Oregon, Washington.

Can warm water from power plants be used for large-scale irrigation. The states of Washington and Oregon are trying to find out. These states will get their answers from a cooperative bi-state program, now underway. Essentially, the program has two parts: One is an irrigation experiment to determine the feasibility of using warm water. The second project is a multiple-use study to formulate an integrated water resource-agriculture-power generation system. The intent is to deliberately integrate the interests of water resource conservationists, the agricultural community and the power-producing entities. The goal is multiple usage of waters to serve the needs of all with minimum penalty to any. Both analytic and experimental approaches will be used, along with large-scale field research. (Houser-NSIC)
W71-09028

HYPERPLASIA IN AN ESTUARINE BRYOZOAN ATTRIBUTABLE TO COAL TAR DERIVATIVES,
National Museum of Natural Sciences, Ottawa (Ontario); and Washington State Shellfish Lab., Willapa Bay, Wash.
N. A. Powell, C. S. Sayce, and D. F. Tufts.
Journal of the Fisheries Research Board of Canada, Vol. 27, No. 11, p 2095-2098, 1970. 3 fig, 3 ref.

Descriptors: *Pathology, *Water pollution effects, *Coal tar coating, *Oily water, *Creosote, Oil, Oil wastes, Wood preservatives (Pesticides), Asphalt, Construction materials, Washington.
Identifiers: *Hyperplasia, *Bryozoans, Tumors, Invertebrate pathology, Carcinogens, Schizoporella sp., Willapa Bay.

Hyperplasia of bryozoan (Schizoporella unicornis) ovicells was noted in portions of Willapa Bay, Washington, where petroleum derivatives were in evidence. In one location, creosote, gasoline, and diesel and engine oil were present, while in another, asphalt-coated creosote was in use. Normal bryozoan colonies were transferred to these areas, and abnormalities occurred within 7-9 days. The authors suggest that this organism might be useful in monitoring estuarine waters for oil pollution. (LeGore-Washington)
W71-09036

THE TOXICITY OF FOUR INSECTICIDES TO FOUR SALMONID SPECIES,
Colorado State Univ., Fort Collins.
George Post, and Thomas R. Schroeder.
Bulletin of Environmental Contamination and Toxicology, Vol. 6, No. 2, p 144-155, 1971. 6 tab, 12 ref. Funded by Bur. of Sport Fishery and Wildlife, Fish Pesticide Research Lab. contract.

Descriptors: *DDT, *Endrin, *Carbamate pesticides, *Organophosphorous pesticides, *Chlorinated hydrocarbon pesticides, *Lethal limit, *Salmon, *Trout, Insecticides, Bioassy, Pesticide toxicity, Fishkill, Mortality, Salmonids, Fish diseases, Fish physiology, Fish toxins, Toxicity.
Identifiers: *Malathion, *Carbaryl, TL-m, Salvelinus sp., Salmo sp., Oncorhynchus sp., Water pollution effects.

A study was conducted to determine the relative toxicity of four commonly used insecticides (DDT, endrin, carbaryl and malathion) to four salmonid fishes commonly used for experimentation. Standard static bioassay procedures were followed. Ninety-six hour TL-m values differ from those in previously published literature. This, it is concluded, is related to any of several variables, e.g. body weight, water quality, fish strain and physical factors. Susceptibility to the various pesticides was definitely species or strain dependent. Carbaryl was generally the least toxic of the four insecticides. (LeGore-Washington)
W71-09037

EFFECT OF PINE LITTER ON QUALITY OF WATER RECEIVED BY SMALL FISHING IMPOUNDMENTS,
Arizona Univ., Tucson. Arizona Cooperative Fishery Unit.
William Seawell, George Adams, and William J. McConnell.
Journal of the Arizona Academy of Sciences, Vol. 5, No. 4, p 263-270, 1969. 2 fig, 6 tab, 20 ref.

Descriptors: Water pollution effects, *Ponderosa pine trees, *Small watersheds, *Runoff, *Leaching, Water quality, Arizona, Temperature, Phenols, Color, Chemical oxygen demand, Carbohydrates, Detritus, Decomposing organic matter.
Identifiers: *Pine litter, *Pine needles, Rose Canyon Lake (Ariz).

From the evidence presented, it does not appear that the organic compounds leached from the Ponderosa Pine needles commonly have a conspicuously beneficial (e.g. trophic) or detrimental

(e.g. oxygen demand, toxicity) effect on the animal community of small water impoundments. This does not, however, rule out the low level, chronic toxicity produced by tanning and/or by related phenolic compounds. Light reduction due to litter-strained runoff may limit primary productivity, which may in turn affect fish production. (Wahtola-Washington)
W71-09038

TOXICITY TESTS WITH OIL DISPERSANTS IN CONNECTION WITH OIL SPILL AT CHEDABUCTO BAY, NOVA SCOTIA,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
John B. Sprague, and William G. Carson.
Fisheries Research Board of Canada, Technical Report No. 201, 1970. 30 p. 5 fig, 2 tab, 4 ref.

Descriptors: *Oily water, *Bioassay, *Lethal limit, *Emulsions, *Emulsifiers, *Toxicity, *Detergents, *Water pollution effects, Oil, Oil wastes, Dispersion, Colloids, Bioindicators, Mortality, Pollution abatement, Water pollution control, Toxins, Non-structural alternatives, Water treatment, Lobsters, Salmon.
Identifiers: *Oil pollution, *Bunker oil, *Corexit 8666, BP 1002, Flounder, Pseudopleuronectes sp., Homarus sp., Salmo sp.

The authors report the results of preliminary screening of several Bunker C oil dispersants for acute toxicity to small salmon (Salmo salar) in fresh water and to winter flounder (Pseudopleuronectes americanus) and lobsters (Homarus americanus) in sea water. Dispersants tested in static bioassays included Corexit 8666, BP 1100B, BP 1100, BP 1002, Gulf Agent 1009, naphtha gas, Dispersant 88, Dispersol SD and XZIT x-1-11. Corexit 8666 appeared to be the least toxic to all organisms, but it is cautioned that an apparent toxicity during degradation should be investigated before this compound is recommended for wide scale use. Five appendices supply detailed test data, holding conditions for test animals, a discussion of toxic degradation products of Corexit 8666, notes on autopsies, and notes on the appearance of test mixtures. (LeGore-Washington)
W71-09039

A REVIEW OF POSSIBLE CAUSES OF MORTALITY OF OYSTER LARVAE OF THE GENUS CRASSOSTREA IN TOMALES BAY, CALIFORNIA,
University of the Pacific, Dillon Beach, Calif. Pacific Marine Station.
Carl J. Berg, Jr.
California Fish and Game, Vol. 57, No. 1, p. 69-75, 1971. 35 ref.

Descriptors: *Larvae, *Oysters, *Turbidity, *Sediments, *Mortality, *Food abundance, Life cycles, Mollusks, Temperature, Salinity, Hydrogen ion concentration, Silts, Organic compounds, Trophic level, Dinoflagellates, Red tide, Diseases, Water pollution effects, California.
Identifiers: Setting, *Spatfall, Cultch, Sedimentation, Spat, Tomales Bay (Calif).

The inability of oysters (Crassostrea sp.) to produce successive generations in Tomales Bay can be attributed to failure of larval survival and set, since the adults do spawn. No single factor is held accountable for the absence of oysters spat. Lack of proper food and nutrients probably is a very important factor. In Tomales Bay, extreme turbidity is responsible for larval loss because all possible places where oyster larvae may settle are soon covered with a layer of mud. Blooms of dinoflagellates are the third major cause of larval mortality. Other causes are not likely to be as important as these three, but they do contribute to generally unfavorable conditions for oyster larvae in this bay. (LeGore-Washington)
W71-09041

THE EFFECTS OF OIL POLLUTION AND CLEANING ON SALT MARSH ECOLOGY,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
J. M. Baker.
Field Studies Council, Oil Pollution Research Unit, Orielton Field Centre, Annual Report, 1969, p 3-26. 16 fig, 18 ref.

Descriptors: *Oil, *Oily water, *Emulsions, *Emulsifiers, *Toxicity, *Water pollution treatment, Water pollution effects, *Salt marshes, *Tidal marshes, *Coastal marshes, *Marsh plants, *Resistance, Oil wastes, Bioassay, Dispersion, Bioindicators, Detergents, Mortality, Pollution abatement, Pathology, Path of pollutants.
Identifiers: *Oil pollution, *Oil spills, *Chronic pollution, Spartina sp., Recovery.

The author concisely summarizes two years of investigation of the effects of oil pollution, both acute and chronic, on salt marsh plants. Effects and phytopathological mechanisms of emulsifiers in general are discussed. It is concluded that salt marshes are quite resistant to isolated incidents, relative to permanent damage, but that chronic oil pollution can kill all vegetation. The degree of recovery ability, however, is not definitively known. It is recommended that oiled salt marshes should be left untreated, at least until more efficacious methods are available. (LeGore-Washington)
W71-09043

THE BIOLOGICAL EFFECTS OF MARINE OIL POLLUTION AND SHORE CLEANSING,
Field Studies Council, Pembroke (England). Oil Pollution Research Unit.
Geoffrey B. Crapp.
Field Studies Council, Oil pollution Research Unit, Orielton Field Centre, Annual Report, 1969, p 27-42. 9 fig, 15 ref.

Descriptors: *Oil, *Oily water, *Emulsifiers, *Toxicity, *Water pollution treatment, Water pollution effects, *Snails, *Mussels, Oil wastes, Bioassay, Emulsions, Dispersion, Bioindicators, Detergents, Mortality, Resistance, Mollusks, Intertidal areas, Shores, Shore protection.
Identifiers: *Oil pollution, *Chronic pollution, *Oil spills, *Barnacles, Repopulation, Recovery, Limpets, Rocky shores.

This report summarizes results in in situ experimentation concerning effects of oil, primarily Kuwait crude and Kuwait atmospheric residue, on shore life, especially barnacles and mollusks. Treatment of shore plots with the emulsifier, BP 1002, was concurrently studied. Laboratory bioassays challanging limpets, mussels and snails with graded concentrations of emulsifiers are also discussed. Recovery of Hazelbeach and Llanreath shores following detergent-cleaning is described, as are ecological effects of oil spillage and of chronic pollution by refinery effluents. (LeGore-Washington)
W71-09044

MICRO-RESPIROMETRY AND EMULSIFIER TOXICITY,
University Coll. of Swansea (Wales).
A. Nelson-Smith.
Field Studies Council, Oil Pollution Research Unit, Orielton Field Centre, Annual Report, 1969, p 43-47. 2 fig, 5 ref.

Descriptors: *Bioassay, *Emulsifiers, *Toxicity, *Water pollution treatment, *Water pollution effects, *Enzymes, *Inhibitors, *Analytical techniques, Emulsions, Bioindicators, Detergents, Resistance, Pollutant identification, Respiration.
Identifiers: *Oil pollution, Respirometer, Microrespirometer.

The Gilson microrespirometer (a Warburg respirometer refinement) was used in an attempt to devise a rapid method of comparing emulsifier toxicities and in a preliminary investigation of the effects of emulsifiers on some enzymes of the tricarboxylic-acid cycle. Emulsifers were tested against standard suspensions of baking yeast. Commercial quality BP 1002 depressed oxygen uptake to a greater degree than did BP 1002 in an experimental, more aliphatic solvent (Blend Y). BP 1100 appeared even less toxic. Crab muscle succinic dehydrogenase and oxoglutarate dehydrogenase were greatly inhibited by BP 1002, while no change in fumarase activity was noted. Isocitric dehydrogenase was unaffected. (LeGore-Washington)
W71-09045

EFFECTS OF PESTICIDES ON EMBRYONIC DEVELOPMENT OF CLAMS AND OYSTERS AND ON SURVIVAL AND GROWTH OF THE LARVAE,
Bureau of Commerical Fisheries, Milford, Conn; and Maryland Univ., Solomons. Natural Resources Inst.
Harry C. Davis, and Herbert Hidu.
U. S. Fish and Wildlife Service, Fishery Bulletin, Vol 67, No 2, p 393-404, 1969. 1 fig, 2 tab, 11 ref.

Descriptors: *Pesticides, *Insecticides, *Herbicides, *Nematocides, *Bactericides, *Fungicides, *Algicides, Water pollution effects, Lethal limit, *Pesticide toxicity, Bioassay, *Clams, *Oysters, *Growth rates, Pesticide drift, Toxicity, Mollusks, Mortality, Embryonic growth stage.
Identifiers: Survival, Growth, *Embryonic development, Morphological effects, Embryo, Development, Morphology (Animal), Mercenaria sp., Crassostrea sp.

Fifty-two compounds were tested for their effects on embryos of the hard clam, Mercenaria mercenaria, and of the American oyster, Crassostrea virginica, and on their larvae. The pesticides included 17 insecticides, 12 herbicides, one nematocide, four solvents, and 18 miscellaneous bactericides, fungicides and algicides. Most of the compounds affected normality of embryonic development more than survival or growth of larvae. Some, however, drastically reduced growth of larvae at concentrations that had relatively little effect on embryonic development. It is necessary, therefore, to evaluate the effects of pesticides on all stages of the life cycle of an organism before the pesticide can be considered safe. Nevertheless, differences in toxicity to bivalve larvae among the compounds of each category of pesticide are large enough that it should be possible to select compounds to control pest species without serious damage to commercial shellfish. (LeGore-Washington)
W71-09047

DYNAMICS OF MS-222 IN THE BLOOD AND BRAIN OF FRESHWATER FISHES DURING ANETHESIA,
Bureau of Sport Fisheries and Wildlife, La Crosse, Wis. Fish Control Lab.
Joseph B. Hunn.
U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Investigations in Fish Control series, No 42, 1970. 11 p, 3 tab, 11 ref.

Descriptors: *Fish physiology, *Path of pollutants, Water pollution effects, *Fish control agents, *Fish management, *Absorption, Analytical techniques, Bioassay, Colorimetry, Color reactions, Laboratory tests, Fish farming, Fish handling facilities, Freshwater fish, Pathology.
Identifiers: Fish handling, MS-222, *Anesthetics, Fish anesthetics, Drugs, Nervous tissue, Brain tissue.

Eleven species of freshwater fishes were rapidly anethetized in solutions of MS-222 (methanesulfonate of meta-aminobenzoic acid ethyl ester) containing 100-1,000 mg of MS-222 per liter. MS-222 concentrations in blood and brain after one minute exposure indicate that MS-222 rapidly diffuses across the gill and passes the blood-brain barrier. Acetylated MS-222 was detected in the blood of all species studied, indicating that the drug is metabolized. The concentration of free MS-222 in

e brain increased with depth of anesthesia to loss reflex and then either increased or declined ghtly as the fish approached medullary collapse. eGore-Washington)
71-09049

FFECT OF MS-222 ON ELECTROLYTE AND ATER CONTENT IN THE BRAIN OF RAIN-)W TROUT,
ireau of Sport Fisheries and Wildlife, La Crosse, is. Fish Control Lab.
ayne A. Willford.
S. Fish and Wildlife Service, Bureau of Sport sheries and Wildlife, Investigations in Fish Con-l Series, No 43, 1970. 7 p, 2 tab, 21 ref.

escriptors: *Fish physiology, *Electrolytes, odium, *Potassium, *Calcium, *Magnesium, on, *Fish control agents, *Fish management, ainbow trout, Diffusion, Ions, Bioassay, Water llution effects, Fish farming, Fish handling facili-s, Pathology, Trout.
entifiers: *MS-222, *Anesthetics, *Fish esthetics, *Zinc, Drugs, Nervous tissue, Brain tis-e, Electrolytic imbalance, Fish handling.

inbow trout (Salmo gairdneri) were exposed to 0 mg/l solutions of the anesthetic, MS-222 ethanesulfonate of meta-aminobenzoic acid yl ester) for 1-, 2-, 4- and 10-minute intervals d their brains were analyzed for sodium, potassi-, calcium, magnesium, zinc, iron and water con-t. The mean potassium content decreased 17.7 and iron increased 56.2% during 2-minute expo-es. Sodium and calcium increased slightly (7.4 d 9.4%); magnesium, zinc and water content nained relatively constant. All of the affected ctrolytes returned toward control values with 4-d 10-minute exposures. These shifts in elec-lytes appear to be related to depth of anesthesia d to the concentrations of free MS-222 in the in. (LeGore-Washington)
71-09050

ke Powell Quality Studies for the Navajo Plant,
chtel Inc., San Francisco, Calif; and Arizona te Univ., Tempe.
S. Riesbol, W. L. Minckley, and R. F. Kilmartin.
per, American Society of Civil Engineers, Na-nal Water Resources Engineers Meeting, oenix, Ariz, Jan 1971. 59 p, 11 fig, 3 tab, 30 ref, pend.

escriptors: *Water quality, Water pollution, alinity, Lakes, Fish, Investigations, Aquatic life, mnology, Hydrology, Climatology, Water tem-rature, Air temperature, Bibliographies, Inflow, issolved solids, Reservoir operation, Stratified w, Public opinion.
entifiers: Lake Powell, Navajo Powerplant, Ariz, lorado River.

ter quality investigations were made at Lake well to provide the basis for design of cooling ter facilities for the Navajo steam electric erating station. The Navajo station cooling vers would have a total waterflow of 1,620,000 /min with an annual makeup requirement of ,000 acre-ft at an average rate of 50 cfs. Under scheme considered, 4,500 acre-ft of blowdown ter would be discharged annually from the cool-towers at an average rate of 6 cfs after 6 con-trations. The investigation was to determine at adverse effects the blowdown water would ve on the aquatic environment of Lake Powell if blowdown water were returned to the lake with additional treatment. Although the study in-ated no adverse effects of such an arrangement, ections were raised to even nominal increases in inity by downstream interests and water quality trol agencies. The report contains water quality dies focused primarily on the lower 15 mi of the e, but necessarily includes an overall view of the e behavior. (USBR)
71-09051

PERSISTENT PESTICIDES IN THE ENVIRONMENT,
Rothamsted Experimental Station, Harpenden (England).
For primary bibliographic entry see Field 05B.
W71-09088

ENVIRONMENTAL MERCURY RESEARCH IN SWEDEN,
Swedish Environment Protection Board, Stockholm.
For primary bibliographic entry see Field 05B.
W71-09089

RESIDUES OF TOTAL MERCURY AND METHYLMERCURIC SALTS IN LAKE TROUT AS A FUNCTION OF AGE,
Cornell Univ., Ithaca, N.Y. Pesticide Residue Lab.
C. A. Bache, W. H. Gutenmann, and D. J. Lisk.
Science, Vol 172 No 3986, p 951-952, May 28, 1971. 2 p, 1 fig, 1 tab, 7 ref.

Descriptors: *Lake trout, *Heavy metals, *Poisons, *Metal organic pesticides, Water pollution sources, Aquatic life, Environmental effects, Trout, Freshwater fish, New York, Water pollution effects.
Identifiers: *Heavy metal poisons, *Mercury, Cayuga Lake (N.Y.).

To relate mercury concentrations to time of exposure of fish, an analysis of the concentration of total mercury and methylmercuric salts in lake trout of precisely known ages from 1 to 12 years has been carried out. Trout from Cayuga Lake, Ithaca, New York, which are tagged and stocked annually as fingerlings, were netted in October 1970 to obtain samples of as many different ages as possible. Mercury can reach the lake from its use in laboratory research, in dental and medical services, in agriculture, in coal burnt in powerplants, and from other sources. The concentrations of both total mercury and methylmercury were found to increase with age of the fish but were not related to the fish sex. A data table presents a list of concentrations of total mercury and methylmercury in the fish by age and the percentage of total mercury that was present as methylmercury. (Lang-USGS)
W71-09104

EUTROPHICATION OF SHELTERED BAYS IN A LARGE LAKE,
Utah State Univ., Logan. Center for Water Resources Research.
William T. Helm.
Available from the National Technical Information Service as PB-200 259, $3.00 in paper copy, $0.95 in microfiche. Center for Water Resources Research, Utah State University, Final Report (undated). 53 p, 6 fig, 5 tab, 55 ref. OWRR Project B-010-UTAH (1).

Descriptors: *Eutrophication, *Lakes, *Bays, Circulation, Distribution, Particle size, Invertebrates, Currents (Water), Nutrients, Oxygen, Respiration, Biological communities, Clays, Environment, Silts, Organic matter, Diptera.
Identifiers: *Sheltered bays, Tanytarsus, Polypedilum, Tendipes, Ordination analysis.

Objectives of this investigation were to determine the quantity and quality of influent in bays or breakwater areas of Bear Lake, Utah-Idaho, and to appraise biological responses to water quality of the bays. Three partially completed studies disclosed the importance of the median grain size of sediments, contents of silt and clay and organic matter, the velocity of currents, and concentration of oxygen near the bottom. The results were subjected to ordination analyses. The structure of communities was influenced by environmental conditions. The median grain size of 0.20 mm is of critical importance for the distribution of benthic invertebrates. The continuum of some chironomids was indicative of the community type and environment. Only three species of chironomids, Tanytarsus A, Polypedilum digitifer, and Tendipes, were present in numbers sufficient to be utilized in production studies. The density of Tanytarsus was indirectly related to silt and clay and organic matter content of the bottom. (Wilde-Wisconsin)
W71-09150

LIMNOLOGY OF LAKE CHAMPLAIN: 1965-1970,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 02H.
W71-09152

OXYGEN PRODUCTION IN SOME NORTHERN INDIANA LAKES,
Manchester Coll., North Manchester, Ind. Dept. of Biology.
William R. Eberly.
Proceedings of the Industrial Waste Conference 17, p 733-747, 1963. 5 fig, 6 tab, 3 ref.

Descriptors: *Oxygen, *Indiana, *Lakes, *Dissolved oxygen, Hypolimnion, Biota, Productivity, Measurement, Metabolism, Profiles, Stratification, Seasonal, Oligotrophy, Eutrophication, Nutrients, Temperature, Photosynthesis, Diffusion, Respiration, Decomposing organic matter, Light, Turbulence, Epilimnion, Thermocline, Winds, Solar radiation, Carbon dioxide, Hydrogen ion concentration.
Identifiers: *Oxygen production, Orthograde oxygen curves, Myers Lake (Ind), McLish Lake (Ind), Taylor Lake (Ind), Meso-orthograde, Plus-heterograde, Meso-clinograde, Clinograde oxygen curves, Mesotrophic, Metalimnion, Morphometry.

An oxygen profile, depicting vertical distribution of dissolved oxygen, is a significant diagnosis of lake character; profiles indicating lake metabolisms strikingly develop during summer stratification, showing lake differences. Orthograde, meso-orthograde, clinograde, meso-clinograde, and plus-heterograde oxygen curves are described. Temperature and light affect oxygen concentration in the greatest variety of ways. Stratification may develop with a warm surface layer overlying the cold bottom layer, the plane of maximum temperature change being the thermocline; oxygen below the epilimnion may accumulate to high concentrations. Transparency of a lake is both cause and effect of its particular productivity pattern. In addition to plankton concentration, transparency varies with turbidity and color. Relation of transparency and production in different lake types is expressed graphically and mathematically. Oxygen production curves are given for three lakes. Some anomalous results indicate that Oscillatoria agardhii may subsist in absence of visible light (or at extremely low intensities) by some chemosynthetic process, perhaps releasing free oxygen. Since Oscillatoria utilizes sulfates, possibly a sulfate deficiency is a limiting factor in production of a deep-water oxygen maximum produced by Oscillatoria. (Jones-Wisconsin)
W71-09153

JAMES RIVER-WILSON CREEK STUDY, SPRINGFIELD, MISSOURI.
Federal Water Pollution Control Admin., Robert S. Kerr Water Research Center, Ada, Okla.

Vol 1, June 1969. 60 p, 14 fig, 2 tab, 23 ref.

Descriptors: *Water pollution effects, *Water pollution control, *Water pollution sources, *Fishkill, Storm runoff, Odor, Subsurface runoff, Groundwater movement, Limestones, Infiltration, Domestic wastes, Benthic fauna, Industrial wastes, Drainage, Aquifers, Sinks, Cities, Sewage treatment, Sewers, Aeration, Monitoring, Landfills, Biochemical oxygen demand, Chemical oxygen demand.
Identifiers: *Urban storm runoff, James River (Mo), Wilson Creek (Mo), Springfield (Mo), Sewage plant bypasses.

Fish kills, associated with storm runoff, and odorous and unsightly conditions in Wilson Creek which flows past Springfield (Mo) and the Wilson's Creek Battlefield National Park prompted investigation. Thunderstorms caused Wilson Creek to dominate flow at point of confluence with the James River. Since the area is underlain with limestone, significant volumes of surface and waste water enter the upper groundwater aquifers through numerous sinkholes and crevices, some of which are in the Wilson Creek bed. This water, passing through a maze of fractures and solution channels in the limestone, often reappears in degraded condition. Possible pollution causes were sewage treatment plant bypasses (especially following rains), scouring of sludge deposits, industrial waste discharges, storm runoff from Springfield, and slugs of poor quality subsurface water from Rader Spring entering surface waters. Recommendations are storm runoff control, sewage treatment plant improvement, improvement of industrial waste treatment facilities, effort to restore Rader Spring to high quality, attempt to preclude pollution of groundwater aquifers, construction of a reservoir on the James River for flow augmentation, and establishment of a monitoring system. History, description of problems and discussion are included. (Jones-Wisconsin)
W71-09154

SHORELINE ALGAE OF WESTERN LAKE ERIE,
Ohio State Univ., Columbus. Graduate Studies in Botany.
Rachel Cox Downing.
The Ohio Journal of Science, Vol 70, No 5, p 257-276, 1970. 97 fig, 37 ref.

Descriptors: *Lake shores, *Algae, *Lake Erie, Aquatic habitats, Lakes, Aquatic environment.
Identifiers: *Algal species, Western Lake Erie, Arnoldiella conchophila Miller.

In spite of some 70 year investigations of algae inhabiting western Lake Erie, almost nothing was known prior to this study of the shoreline as a specific habitat of these organisms. This site harbors 61 taxa, 39 of which are new records for this part of the lake, and one, Arnoldiella conchophila Miller, was previously reported only from central Russia. (Wilde-Wisconsin)
W71-09156

FUTURE PROSPECTS OF ALGAE AND MAN,
Vermont Univ., Burlington. Dept. of Botany.
Richard M. Klein.
Annals New York Academy of Sciences, Vol 175, p 778-781, 1970. 9 ref.

Descriptors: *Algae, *Human population, Fertilizers, Diatomaceous earth, Food chains, Oxygen, Ecology, Rhodophyta, Phaeophyta, Chlorella, Plant pathology, Industries, Ions, Cyanophyta, Radioisotopes, Temperature, Ecosystems, California, Irrigation, Economic feasibility, Water pollution control, California, Arizona.
Identifiers: Fodder, Glue, Agar, Polysiphonia, Antibiotics, Iodine, Atomic energy, Reactor cooling, Imperial Valley (Calif), Los Angeles (Calif), Tucson (Ariz).

Economic criteria of how and where algae can be used to serve man's biological, physical, and esthetic needs is considered. Although the acknowledged base of all food chains and the primary source for most of the earth's oxygen, the economic potential of algae has barely been explored. The larger red and brown algae are increasingly needed for fertilizers and fodder; antibiotics are derived from Chlorella, Polysiphonia, and other species; iodine has been obtained by burning marine algae. The potentials of utilizing the ability of algae to concentrate mineral ions hundreds of times the concentration in water, the control of speciation and its effect on pollution, possible utilization of blue-green algal parasites for increasing concentration of nitrates and phosphates sufficiently that algae may be harvested for commercial usage; use of halophytic algae in lowering excessive concentration of sodium chloride in drinking water. The qualitative and quantitative alteration in spectrum of algae species as the result of atomic energy plant operations and their effects on man are unknown, particularly whether algae will accumulate radioactive ions effectively. Algal toxonomists, algal physiologists, and algal histochemists must consider themselves ecologists and pool their knowledge to contribute to humanity's welfare. (Auen-Wisconsin)
W71-09157

DISTRIBUTION AND ABUNDANCE OF TUBIFICID (OLIGOCHAETA) SPECIES IN TORONTO HARBOUR, LAKE ONTARIO,
Toronto Univ. (Ontario). Dept. of Zoology.
R. O. Brinkhurst.
Journal Fisheries Research Board of Canada, Vol 27, No 11, p 1961-1969, 1970. 7 fig, 3 tab, 8 ref.

Descriptors: *Distribution, *Tubificids, *Oligochaetes, *Lake Ontario, Population, Harbors, Water pollution effects, Coliforms, Biochemical oxygen demand, Dissolved oxygen, Lake Superior, Indicators, Biomass, Nitrogen, Phosphorus, Industries, Water pollution sources, Sediments.
Identifiers: *Toronto Harbor (Canada), Lake Ontario (Canada), River mouth, Detroit River (Ontario-Mich), Don River (Ontario), Tubifex tubifex, Limnodrilus hoffmeisteri, Peloscolex multisetosus, Aulodrilus pluriseta, Potamothrix vejdovskyi, Potamothrix hammoniensis.

Dry weight values, identity, and abundance of tubificid species in Toronto Harbor were determined. The tubificid oligochaetes build up populations in excess of 200,000 per square meter. At the mouth of the Don River, an abundance of pollution-tolerant species are located, whereas small numbers and some less pollution-tolerant species are found near the island shores. No evidence of diurnal rhythms in the vertical distribution of the worms in sediment was found. That the tubificids can be used as indicators of organic pollution is confirmed by this survey, but relative abundance of worms and other benthic organisms, as well as relative profusion of the worm species themselves, rather than the mere presence of certain species, demands attention. Tubifex tubifex and Limnodrilus hoffmeisteri in great abundance and in the absence of other benthic organisms indicate gross organic pollution, as evident in Toronto Harbor and in the Don River where they constitute the entire benthos. Dry weights for tubificids are about 16% of wet weight for fresh-starved worms. Ash content averaged 34% of dry weight for worms with gut full of mud, but 11% for worms clear of gut contents. (Jones-Wisconsin)
W71-09159

THE FATTY ACID COMPOSITION OF TWO MARINE FILTER-FEEDERS IN RELATION TO A PHYTOPLANKTON DIET,
National Inst. of Oceanography, Wormley (England).
F. Culkin, and R. J. Morris.
Deep-Sea Research, Vol 17, No 5, p 861-865, 1970. 2 tab, 14 ref.

Descriptors: *Lipids, *Marine animals, *Diets, Phytoplankton, Diatoms, Gas chromatography, Atlantic Ocean, Zooplankton.
Identifiers: Tunicates, Fatty acids, Filter-feeders, Pyrosoma, Salpa cylindrica, Polyunsaturated acids, North Atlantic, Chemical composition.

The fatty acids of two tunicate filter-feeders, Pyrosoma (Peron) and Salpa cylindrica Cuvier, which feed directly on phytoplankton, were analyzed. Sufficiently large quantities for fatty acid analyses of phytoplankton from the same region could not be collected thus the known major features of phytoplankton fatty acid composition were used for comparison. Plant fatty acids differ from those of zooplankton. The stage in the food chain at which this modification of the phytoplankton fatty acid pattern takes place is not clear. The two species of tunicate were found to be very similar in fatty acid composition (examined by gas-liquid chromatography) and, qualitatively, to other zooplankton. However, the levels of myristic acid were considerably higher than those found in other zooplankton examined in this study, which is consistent with a phytoplankton diet. In common with phytoplankton, the tunicates were found to contain a high proportion (13x9% and 12x6% of total acids respectively) of myristic acid (14:0). Their principal polyunsaturated acid was 22.6 omega 3 and the polyunsaturated acids of the carbon-16 series, whih are usually present in phytoplankton, were not detected. (Jones-Wisconsin)
W71-09160

MERCURY--MAJOR NEW ENVIRONMENTAL PROBLEM,
New York State Dept. of Environmental Conservation, Albany. Bureau of Fish.
For primary bibliographic entry see Field 05B.
W71-09164

ON THE GROSS AND NET PRODUCTION OF PERIPHYTON AND PLANKTON ALGAE, (IN RUSSIAN),
Irkutskii Gosudarstvenyi Universitet (SSSR).
O. M. Kozhova.
Doklady Akademii nauk SSSR, Vol 195, No 4, p 965-968, 1970. 3 tab, 5 ref.

Descriptors: *Periphyton, *Plankton, *Productivity, Photosynthesis, Biomass, Oxygen, Algae, Comparative productivity, Eutrophication.
Identifiers: Bratsk Reservoir (Siberia), Angara River (Siberia).

This study of the Bratsk Basin included determinations of photosynthesis of periphyton by light and dark bottles, and production of phytoplankton by the Vinberg oxygen method. The reported results present averages for vegetation seasons of 1964 and 1967 for phytoplankton, and of 1965, 1967, and 1968 for periphyton. The phytoplankton consisted largely of Melosira, Stephanodiscus, Asterionella, and Cryptomonadacea sp in the spring, and of Aphanizomenon and Ceratium sp in summer. The predominant members of periphyton included Cladophora, Ulothrix, Oedogonium, Spirogyra, and Mougeotia sp. The diurnal gross and net production of periphytonic algae was 44.2 and 33.8 mg oxygen per g of fresh weight, respectively. The production to biomass ratio (P/B coefficient) of phytoplankton, recalculated on carbon, was appreciably higher than that of the periphyton. (Wilde-Wisconsin)
W71-09165

LOCALIZATION OF DDT IN THE BODY ORGANS OF PINK AND WHITE SHRIMP,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
D. R. Nimmo, A. J. Wilson, Jr., and R. R. Blackman.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 4, p 333-341, 1970. 7 tab, 3 ref.

Descriptors: *DDT, *Shrimp, *Pesticides, Pesticide residues, Laboratory tests, Water pollution effects, Marine animals.
Identifiers: *Body organs, *Penaeus duorarum, *Penaeus setiferus, DDD, DDE, Hepatopancreas.

Shrimp were exposed to low concentrations of DDT in the laboratory for extended periods to compare the residues accumulated under controlled conditions with residues in natural populations. After being subjected to selected concentrations, the amount and rate of accumulation, the lethal concentration, and the amount of DDT accumulated in individual organs were determined. All shrimp exposed to 0.2 ppb DDT died within 18 days and all shrimp exposed to 0.12 ppb died within 28 days. Analysis of organs confirmed that DDT

concentrated in the hepatopancreas. Findings
w that the magnitude of contamination in some
he field samples approached that of treated
mp. Analysis of shrimp from field collections
firmed the laboratory observations that DDT
localized in the hepatopancreas; this organ is
arded when the animals are processed as food
uman consumption. The edible tail muscle had
least residue--well below that considered
rdous to human health. The survival of
eid shrimp would be threatened if relatively
amounts of DDT reached the shrimp nursery
s in estuaries and remained relatively constant.
es-Wisconsin)
-09167

IAL UPTAKE, DISTRIBUTION AND LOSS SOLUBLE Ru-106 IN MARINE AND FRESH-TER ORGANISMS IN LABORATORY CON-IONS,
tre d'Etude de l'Energie Nucleaire, Brussels
gium). Dept. of Radiobiology.
an der Borght, and S. van Puymbroeck.
lth Physics, Vol 19 (Dec), p 801-811, 1970. 10
tab, 15 ref.

criptors: *Absorption, *Distribution,
dioisotopes, *Marine animals, *Marine plants,
atic animals, Laboratory tests, Nitrates, Mus-
Snails, Fish, Algae, Gastropods, Adsorption,
perature, Metabolism, Kinetics, Water pollu-
effects, Nuclear wastes.
tifiers: Ruthenium, Fixation, Tissues, Alburnus
lus, Belgium.

wastes from nuclear reprocessing plants,
enium-106 is apparently the most important
isotope contaminating algae and fish. This in-
gation was conducted to understand the fac-
such as environmental conditions, and
icochemical state of ruthenium on the radioac-
contamination of organisms, and the early
tics of fixation, distribution and release of solu-
uthenium orginating from nitrate nitrosyl com-
es by some marine and freshwater organisms.
early uptake, distribution and loss by mussels,
s, fish, algae, and two gastropods of rutheni-
106 were studied for short periods under
ratory conditions. Initial uptake and distribu-
of ruthenium-106 is similar in the marine and
water lamellibranch (Mytilus and Anodonta),
ixation is much higher in the freshwater snail,
parus, than in the fish, Alburnus. In the
contamination of organisms by soluble
enium, thin structures, such as byssus, in direct
act with water, show high ruthenium content,
cating the important role of surface adsorption.
perature-dependance suggests metabolic inter-
nce, although temperature-dependance and
ral kinetics of the uptake are similar both in
and in animals studied. Slower uptake of
pes at lower temperatures indicates the advisa-
to release radioactive wastes during periods
w metabolic activity. (Jones-Wisconsin)
-09168

ITEMPORANEOUS DISEQUILIBRIUM, A HYPOTHESIS TO EXPLAIN THE RADOX OF THE PLANKTON',
ornia Univ., Davis. Dept. of Zoology; and
ornia Univ., Davis. Inst. of Ecology.
r Richerson, Richard Armstrong, and Charles
oldman.
eedings of the National Academy of Sciences,
67, No 4, p 1710-1714, 1970. 2 fig, 1 tab, 10

criptors: *Phytoplankton, *Lakes, Epilimnion,
lankton, Distribution, Primary productivity,
e, Biomass, Oligotrophy, Diatoms, Euglena,
nia, Habitats, Niches, Competition, Califor-

tifiers: *Contemporaneous disequilibrium,
Tahoe (Calif), Castle Lake (Calif), Diversity,
hes.

Unexpectedly high diversity found in even small samples of lake phytoplankton has been termed 'the paradox of the plankton.' A small volume of water, for example 10 ml, usually shows some tens of species where the competitive exclusion principle might lead to expectation of only one or a few species. Patches of water may exist in which one species competes advantageously relative to the others. They are stable enough for considerable patchiness among phytoplankton, but are obliterated frequently enough to prevent exclusive occupation of each niche by a single species. With epilimnion mixing, only one or at most, a few niches for primary producers might be expected. In samples from Castle Lake, California, a high degree of patchiness for many phytoplankton species was found, indicating mixing rate is sufficiently slow in relation to the algal productivity rate, for many different niches to exist simultaneously. In Lake Tahoe, productivity per unit biomass ratios show that turnover times for carbon are often less than one day. High diversity is associated with high productivity per unit biomass and high zooplankton populations. A contemporaneous disequilibrium model is a plausible explanation of the diversity. (Jones-Wisconsin)
W71-09171

PHOTOSYNTHESIS IN THE ALGAE,
Brandeis Univ., Waltham, Mass. Dept. of Biology.
Martin Gibbs, Erwin Latzko, Michael J. Harvey, Zvi Plaut, and Y. Shain.
Annals New York Academy of Sciences, Vol 175, p 541-554, 1970. 5 fig, 6 tab, 40 ref.

Descriptors: *Biochemistry, *Photosynthesis, *Algae, Phylogeny, Carbon cycle, Enzymes, Metabolism, Hydrogen, Euglena, Chlorella, Scenedesmus, Chlamydomonas, Cyanophyta, Chlorophyta, Oxygen, Light, Chrysophyta, Ochromonas, Respiration, Chlorophyll, Carbon radioisotopes, Carbon dioxide, Rhodophyta.
Identifiers: Warburg effect, Euglena graclis, Calvin cycle, Anacystis nidulans.

The photosynthetic carbon reduction cycle in algae is discussed from evidence described in the literature; this cycle is now firmly established. Twelve enzymically catalyzed steps are involved. At least ribulose 1,5-diP carboxylase and fructose 1,6-diphosphatase are involved in carbon dioxide fixation. The bulk of the evidence suggests that the carbon reduction cycle is the major pathway for the entry of photosynthetically assimilated carbon dioxide in the majority of chlorophyllous algae. On the basis of present knowledge of photosynthetic carbon assimilation in algae, the autotrophic phase ceases with the light-catalyzed conversion of carbon dioxide into fructose 6-P and glucose 6P. The heterotrophic phase commences with their conversion into other cellular components, sometimes referred to as secondary products. Important evidence for metabolic regulation of the photosynthetic carbon reduction cycle in algae indicates the cycle is not isolated from the rest of the cell metabolism. Assessment of the true value of these results was hindered by possible interchange of intermediates common to both photosynthesis and respiration. Successful isolation of algal chloroplasts from the giant cell of Acetabularia mediterranea, able to carry out normal photosynthesis, was recently accomplished. (Jones-Wisconsin)
W71-09172

HYPNODINIUM-LIKE ALGAL BLOOMS IN GEORGIA LAKES,
Georgia State Univ., Atlanta. Dept. of Biology; and Georgia Water Quality Control Board, Atlanta.
D. G. Ahearn, Edward T. Hall, Jr., and Donald J. Reinhardt.
BioScience, (Research Reports), p 115, February 1, 1971. 1 fig, 1 ref.

Descriptors: *Algae, *Lakes, *Georgia, Sewage effluents, Water pollution effects, Water pollution sources, Eutrophication, Coliforms, Spores, Life cycles, Odor, Recreation, Systematics.
Identifiers: *White algal blooms, Hypnodinium, Lake Sidney Lanier (Georgia), Lake Jackson (Georgia), Lake Cardinal (Georgia), Lake Buckhorn (Georgia).

Lakes on different river systems in northwest Georgia produced a white algal bloom of varying intensity in June, lasting 7-10 days. At its peak, dense surface flocs were found where sewage effluents were received, in all the 1970 bloom sites. Prior to, during, and after the bloom, hydrographic conditions in the Flat Creek area of Lake Lanier were monitored with observations on thermocline, temperature, pH, dissolved oxygen. Four days prior to the appearance of the bloom, the fecal coliform density increased from less than 4/100 ml to more than 240/100 ml. The milky white surface scum from all lakes was composed of bodies surrounded with a clear envelope containing large protoplasmic bodies. A dark protoplastic body matured into a dark macrospore which subdivided producing 2 to 15 or more bi-pored microspores. No exit of protoplasmic bodies through the pores was observed, although bi-flagellated zoospores occurred in large numbers in the microscope preparations. The bi-pored cells of this alga make it distinct from Hypnodinium sphaericum Klebs. It has not been directly associated with fish kills. A disagreeable odor accompanies the bloom and the thick surface flocs interfere with recreation. (Jones-Wisconsin)
W71-09173

BIOLOGICAL EVALUATION OF ENVIRONMENTAL QUALITY, GREEN BAY, LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
R. P. Howmiller, and A. M. Beeton.
Journal Water Pollution Control Federation, Vol 43, No 1, p 123-133, 1971. 8 fig, 2 tab, 18 ref.

Descriptors: *Evaluation, *Biological communities, *Oligochaetes, Water pollution sources, Environment, Water pollution effects, Sampling, Eutrophication, Benthic fauna, Nematodes, Amphipoda, Clams, Isopods, Snails, Midges, Caddisflies, Tubificids, Lake Michigan, Mayflies, Invertebrates, Diptera, Larvae, Wisconsin.
Identifiers: *Green Bay (Wis), Fox River (Wis), Lumbriculidae, Naididae, Leeches, Hexagenia, Sphaeriidae.

Benthos of lower and middle Green Bay (Wisconsin) were sampled in May 1969 to correspond with the same date 17 years earlier, using the same stations and nearly identical equipment in an attempt to eliminate discrepancies due to different apparatus, methodology and season of past studies. In 1952 Oligochaeta accounted for an average of 66% of the benthic organisms from Stations 2 to 10; in 1969 an average of 85%. Leeches were less abundant and less widely distributed in 1969 than in 1952. Snails occurred at ten stations in 1952 but at two in 1969. Fingernail clams were less abundant in 1969 than in 1952. While no naiad clams were reported in 1952, Lampsilis siliquoidea was found at Station 15 in 1969. The distribution of amphipods, similar in 1952 and 1969, showed more abundance and comprised a larger population percentage in 1952; Hexagenia has disappeared. The midges, pollution tolerant second only to Oligochaeta, decreased near Fox River mounth, increased north of Lon Tail Point, but decreased in relative importance. Thus benethic invertebrates, other than Oligochaeta and Chironomidae, were less abundant in 1969 than 1952 suggesting that the deterioration of the bay environment is continuing. (Jones-Wisconsin)
W71-09174

PRODUCTION, MINERAL NUTRIENT ABSORPTION, AND BIOCHEMICAL ASSIMILATION BY JUSTICIA AMERICANA AND ALTERNANTHERA PHILOXEROIDES,
Auburn Univ., Ala. Agricultural Experiment Station.
Claude E. Boyd.
Archiv fur Hydrobiologie, Vol 66, No 2, p 139-160, 1969. 3 fig, 14 tab, 23 ref.

Descriptors: *Aquatic plants, *Productivity, *Nutrients, *Absorption, Biochemistry, Seasonal, Inorganic compounds, Storage, Phytoplankton, Amino acids, Organic compounds, Cellulose, Proteins, Standing crop, Phosphorus, Alligatorweed, Chemical analysis, Nitrogen, Alkalinity, Cattails, Pondweeds.
Identifiers: *Biochemical assimilation, *Justicia americana, *Alternanthera philoxeroides, Mineral nutrients, Lake Ogletree (Ala), Lake Seminole (Fla), Angiosperms, Nutrient storage, Caloric content, Dry matter production.

Aquatic angiosperms probably play an important role in biogeochemical cycles of many lakes. Comprehensive studies were made to determine the amounts of nutrients bound in lake vascular flora, evaluating production, mineral absorption, and biochemical assimilation for stands of Justicia americana (L) Vahl and some comparative data obtained for alligator weed, Alternanthera philoxeroides (Mart) Griseb. Both species are emergent perennial herbs, frequently occurring in extensive, relatively monospecific, stands in shallow water areas. Net dry matter production in a Justicia americana stand was complete by mid-July. During late May and early June, maximum rate of net productivity occurred with percentage composition of most chemical constituents declining steadily as the growing season progressed. The maximum absorption rate of mobile mineral nutrients occurred prior to maximum growth. The greatest quantity of these nutrients was absorbed early and then utilized for subsequent growth. Net production of several biochemical constituents was complete by mid-June. Alternanthera philoxeroides behaved similarly. Lentic J americana stands had higher dry matter standing crops than lotic stands. There was a relation between water hardness and chemical composition of various stands. (Jones-Wisconsin)
W71-09178

A PLASTIC BARRIER FOR SPOT TREATMENT OF AQUATIC VEGETATION,
Texas Parks and Wildlife Dept., Waco.
R. L. White, and R. L. Bounds.
The Progressive Fish-Culturist, p 57-59, January 1971.

Descriptors: *Aquatic plants, *Herbicides, *Treatment, Diffusion, Barriers, Chemcontrol, Texas, Fishing, Recreation.
Identifiers: Myriophyllum brasiliense, Najas guadalupensis, Polyethylene sheeting, Aquathol Plus, Lake Inks (Tex), Lake Lyndon B Johnson (Tex).

Central Texas Highland lakes are most conducive to aquatic vegetation growth, impeding recreational fishing. Complete lake treatment was cost prohibitive and spot treatment by liquid and pelleted chemicals proved ineffective due to dilution. A barrier of polyethylene sheeting, to prevent dilution through wave action, was tested on sites ranging from 0.25 acre to 1.00 acre; the chemical used was Aquathol Plus. Barriers were attached to old gill nets and steel rods driven into lake bottom for stability. Where rock bottoms prevented installation of rods, styrofoam blocks raised the sheeting. Except where a barrier was destroyed by wind or inundation, the plots were cleared of vegetation for a minimum of three months; eleven sites showed no regrowth six months after treatment. Vegetation outside the plots showed little or no effect from chemical diffusion through the sheeting. Some fish became entangled, but the barriers were not damaged. A treatment rate of 1.00 ppm with a 36-hour use of the barrier was most effective. Sites were treated early in the spring and vegetation control continued into late fall when cooler temperatures inhibited regrowth. (Jones-Wisconsin)
W71-09179

COEFFICIENTS OF ACCUMULATION OF THE RADIOISOTOPE IRON-59 BY CERTAIN SPECIES OF FRESH WATER PLANTS,
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. of Botany.
N. I. Matulyavichene.
Radiobiology, Vol 10, No 3, p 461-463, May-June 1970. 1 fig, 2 tab, 6 ref. AEC-tr-7193 from Radiobiologiya.

Descriptors: *Aquatic plants, *Radioisotope, *Absorption, Iron, Fresh water, Chara, Water pollution effects.
Identifiers: *Iron radioisotopes.

The effect of environmental factors on the uptake of iron-59 from water by aquatic plants was studied. Uptake was 12 -75% higher from natural lake water in an aquarium as compared with water which simulated the chemical composition of the lake water, but did not contain the suspended organic and inorganic material that was present in the lake water. A change in pH from 5.3 to 8.9 decreased uptake from 30 to 37 %. (Bopp-NSIC)
W71-09180

BOMB CARBON-14 IN DEEP SEA ORGANISMS,
California Univ., San Diego; and Washington Univ., Seattle.
For primary bibliographic entry see Field 05B.
W71-09181

INITIAL UPTAKE, DISTRIBUTION AND LOSS OF SOLUBLE RUTHENIUM-106 IN MARINE AND FRESHWATER ORGANISMS IN LABORATORY CONDITIONS,
Centre d'Etude de l'Energie Nucleaire, Brussels (Belgium). Dept. of Radiobiology.
O. Van der Borght, and S. Van Puymbroeck.
Health Physics, Vol. 19, p 801-811, Dec. 1970.

Descriptors: *Radioisotopes, *Marine animals, *Absorption, Aquaria, Mollusks, Snails, Mussels, Marine algae, Aquatic animals, Fresh water, Freshwater fish, Temperature, Kinetics, Nuclear wastes, Solubility, Adsorption, Water pollution effects, Food chains.
Identifiers: *Ruthenium radioisotopes.

Ruthenium uptake extending to long-term equilibria were studied since this element is often the limiting factor in the disposal of wastes from nuclear reprocessing plants. The general kinetics including the temperature dependence were similar for four marine organisms (an alga, a mussel, and two snails); and the initial uptake was similar for marine and freshwater mussels. A relatively high concentration in thin organs in direct contact with the water suggested that surface absorption plays a role. Release of wastes during periods of low temperature (winter) will minimize biological concentration before dilution in the biosphere. (Bopp-NSIC)
W71-09182

RADIOACTIVE POLLUTION OF RIVERS IN CZECHOSLOVAKIA,
Ustav Hygieny, Prague (Czechoslovakia).
For primary bibliographic entry see Field 05B.
W71-09183

STUDY OF THE PHYSICAL CHEMISTRY OF RUTHENIUM IN SEA WATER, (IN FRENCH),
Commissariat a l'Energie Atomique, La Hague (France).
For primary bibliographic entry see Field 05B.
W71-09184

RADIATION ECOLOGY STUDIES, PROGRESS REPORT, JAN. 1968-JAN. 1969,
Emory Univ., Atlanta, Ga.
Robert B. Platt.
Available from the National Technical Information Service as ORO-2412-16, $3.00 in paper copy, $0.95 in microfiche. Report ORO-2412-16, 1969. 48 p.

Descriptors: *Radioecology, *Soil-water-plant relationships, *Radioactivity effects, Estuarine environment, Fungi, Isopods, Ecosystems, Ecology, Drainage patterns.

The report is divided into five subprojects: (1) Studies of the ecology of Panola Mountain included determination of soil moisture content, soil composition, and radionuclide content of plants. A map was prepared to show distribution of major soil islands, forested communities, and drainage patterns across the granite outcrop. (2) Investigations were conducted on the fungal ecology of the granite outcrops, and (3) the effect of microweathering of the granite on plant growth. (4) Gamma irradiation of wheat seed and (5) osmoregulation in intramarsupial and newly-shed young of an estuarine isopod were studied. (Bopp-NSIC)
W71-09185

EFFECTS OF LIMNOLOGICAL FACTORS ON UPTAKE OF CESIUM-137 FALLOUT BY FISH. TECHNICAL PROGRESS REPORT, JUNE 1969-FEB. 1970,
Michigan State Univ., East Lansing.
Niles R. Kevern, Steven Spigarelli, and James Seelye.
Available from the National Technical Information Service as COO-1795-2, $3.00 in paper copy, $0.95 in microfiche. Report COO-1795-2, 1970. 13 p.

Descriptors: *Bass, *Lakes, *Radioisotopes, Cesium, Potassium, Alkalinity, Conductivity, Absorption, Ion exchange, Radiochemical analysis, Water analysis, Trophic level, Water pollution effects.
Identifiers: *Cesium radioisotopes.

Bass samples were collected from five lakes during 1968 and from all six lakes during 1969. A new technique of wet ashing fish was developed which decreases the analysis time and ensures against the loss of cesium caused by thermal volatilization. A portion of the bass samples was analyzed for cesium-137 and cesium and the results show an inverse relationship with the specific conductance of the water and a direct relationship with the concentration of cesium-137 in the water. A new technique of analyses of lake water involving the use of an ion-exchange resin that is specific for cesium was developed. Objectives of the study were to determine the effect of selected water quality parameters on cesium-137 uptake on fish (alkalinity, conductivity, cesium, potassium). Premises on which the study is based have been supported. (Bopp-NSIC)
W71-09186

INTERACTION OF TRACE ELEMENTS WITH THE ORGANIC CONSTITUENTS IN THE MARINE ENVIRONMENT,
Bhabha Atomic Research Centre, Bombay (India).
M. V. M. Desai, and A. K. Canguly.
Available from the National Technical Information Service as BARC-488, $3.00 in paper copy, $0.95 in microfiche. Report BARC-488, 1970. 117 p, 15 fig, 41 tab, 47 ref.

Descriptors: *Radioisotopes, *Organic compounds, *Marine algae, Phytoplankton, Humic acids, Fulvic acids, Trace elements, Chemical analysis, Ion exchange, Absorption, Strontium radioisotopes, Zinc radioisotopes, Cobalt radioisotopes, Uranium radioisotopes, Radium raiodisotopes, Aluminum, Iron, Copper, Magnesium, Managnese, Calcium, Chromium, Potassium, Chelation, Metabolism, Nuclear wastes, Water pollution effects.
Identifiers: Manganese radioisotopes, Cesium radioisotopes, Ruthenium radioisotopes, Cerium radioisotopes, Thorium radioisotopes, Iron radioisotopes, Zirconium radioisotopes, Zinc.

Low-level nuclear wastes dishcharge into the environment the radioisotopes of zinc, manganese, iron, cobalt, radium, thorium, uranium, etc. In the present work it is shown that the radionuclides are solubilized by growth products of marine organisms. Complexation of radionuclides was studied when phytoplankton was grown in a medium spiked with radionuclides in different phases. Humic and fulvic acids were extracted from sea

r and analyzed for trace elements. The studies
v mechanisms by which the availability may be
eased through aquatic food chains to man.
pp-NSIC)
-09188

IUM-226 CONTENT OF WATER AND NKTON FROM THE CHALK RIVER AREA,
nic Energy of Canada Ltd., Chalk River (On-
). Chalk River Nuclear Labs.
avlik.
lable from the National Technical Information
ice as AECL-3687, $3.00 in paper copy, $0.95
icrofiche. Report AECL-3687, Aug. 1970. 29

riptors: *Radium radioisotopes, *Water pollu-
sources, *Plankton, Lakes, Rivers, Wells,
estic water.
tifiers: Canada, Chalk River.

n March 1969-Feb. 1970, 12 localities (includ-
our lakes, the Ottawa River, and well water)
sampled monthly. Water was from 0.1 to 6.2
; lake plankton, from 0.1 to 11.1 pCi/g dry
ht. This corresponds to the natural
ground level. (Bopp-NSIC)
-09189

**HWAYS OF TRACE ELEMENTS IN ARC-
LAKE ECOSYSTEMS. PROGRESS RE-
T, APRIL 15, 1970-APRIL 14, 1971,**
ka Univ., College. Inst. of Marine Sciences.
Barsdate.
lable from the National Technical Information
ce as SAN-310-P-4-10, $3.00 in paper copy,
5 in microfiche. Report SAN-310-P-4-10, Jan.
, 151 p. AEC Contract AT (04-3)-310.

riptors: *Ecosystems, *Alaska, *Lakes, Arc-
Productivity, Eutrophication, Red Tide, Silica,
c, Phytoplankton, Freezing, Temperature,
ation, Hydrogen ion concentration, Dys-
y, Zinc radioisotopes, Cobalt radioisotopes,
phorus radioisotopes, Sediments, Trace ele-
s, Volcanoes, Benthic flora, Alkalinity,
osynthesis, Hydrologic aspects, Magmatic
r, Water pollution sources.
ifiers: Zinc, Manganese radioisotopes.

report considers five subjects: The Field Pro-
at Point Barrow; Character and Residence
for Organic Complexes of Trace Metals As-
ted with a Red Tide; A Study of Zinc Com-
ation with Organic Material from a Natural
r System; Physical Limnology, Chemistry and
Productivity of a Taiga Lake; and Effects of
anic Ashfalls on Alaskan Lakes. (Bopp-NSIC)
-09190

**LOGICAL STUDIES OF RADIOACTIVITY
THE COLUMBIA RIVER ESTUARY AND
ACENT PACIFIC OCEAN. PROGRESS RE-
T, JULY 1, 1968-June 30, 1969. PART B,
LOGICAL ASPECTS.**
on State Univ., Corvallis. Dept. of Oceanog-
y.

s McCauley, (comp. and ed.). Available from
National Technical Information Service as
-1750-54, $3.00 in paper copy, $0.95 in
ofiche. Report RLO-1750-54, July 1969. p 97-

riptors: *Radioisotopes, *Absorption,
ioecology, *Aquatic environment, Ecology,
ystems, Estuaries, Estuarine environment,
r pollution effects, Marine fish, Marine organ-
Gastropods, Annelids, Shrimp, Benthic fauna,
e elements, Phosphorus radionuclides, Zinc
nuclides, Crabs.
ifiers: Chromium radionuclides.

report includes 36 papers. Among the more
al topics are: Introduction to Biological
cts of Radioecology, Diversity and Similarity of Benthic Populations off the Coast of Oregon, Sound Scattering by Marine Organisms in the Northeastern Pacific Ocean, Feeding Habits of Benthic Fish, Plankton and Nutrient Ecology of the Columbia River Estuary, Ecology and Radioecology of Benthic Animals, Radioecology of Benthic Fishes, Trace Element Characterization of Phytoplankton, Trace Element Composition of Northeastern Pacific Foraminifers, Transfer of Radionuclides through a Marine Food Web, and Estuary-Ocean Boundary Studies. In addition there are nine papers on the uptake of radiophosphorus or radiozinc by marine organisms. (Bopp-NSIC)
W71-09191

EVALUATION OF INTERNAL IRRADITION DOSES FROM INGESTION BY HUMAN POPULATION OF FOOD CONTAMINATED BY SR-90 AND CS-137 FOR SETTING LEVELS FOR DISPOSAL IN THE ENVIRONMENT, (IN FRENCH),
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
Arlette Garnier.
Available from the National Technical Information Service as CEA-CONF-1552, $3.00 in paper copy, $0.95 in microfiche. CEA-CONF-1552, 1970, 26 p, 14 fig, 5 tab, 8 ref.

Descriptors: *Strontium radioisotopes, *Water pollution effects, *Food chains, *Mathematical models, Absorption, Path of pollutants, Nuclear wastes, Environmental engineering, Aquatic environment, Water pollution effects.
Identifiers: *Cerium radioisotopes.

Models to determine radionuclide intake through foods are described. A model is formulated for the case of constant disposal of waste to the environment, which includes the following: concentration in aquatic food chains, uptake in food by man, and removal of radioactivity by radioactive decay and elimination. (Bopp-NSIC)
W71-09192

MECHANISMS OF THE ACCUMULATION OF PLUTONIUM-239 AND POLONIUM-210 BY THE BROWN ALGA ASCOPHYLLUM NODOSUM AND MARINE PHYTOPLANKTON,
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
V. S. Zlobin, and O. V. Mokanu.
Available from the National Technical Information Service as AEC-tr-7205, $3.00 in paper copy, $0.95 in microfiche. (Radiobiology), Vol. 10, No. 4, p 584-589, July-August 1970, 3 fig, 4 tab, 18 ref) AEC-tr-7205 from Radiobiologiya.

Descriptors: *Radioisotopes, *Phytoplankton, *Metabolism, *Absorption, Marine plants, Marine algae, Phaephyta, Aquaria, Particle size, Colloids, Water pollution effects.
Identifiers: *Polonium, *Plutonium.

Radionuclide uptake by a brown alga was studied in laboratory aquaria; by phytoplankton cultured from surface sea water, in shipboard aquaria. The effect of inhibitors of the cytochrome system (cadmium chloride, sodium cyanide, and ammonium nitrate) indicated that uptake was affected by cell respiration. The radionuclides were shown to be in the form of colloids. The particle size of the plutonium salt was 0.1-0.3 microns; of the polonium salt, 0.3-15 microns. (Bopp-NSIC)
W71-09193

ECOLOGICAL SCIENCES DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING JULY 31, 1970.
Oak Ridge National Lab., Tenn. Ecological Sciences Div.

Available from the National Technical Information Service as ORNL-4634, $3.00 in paper copy, $0.95 in microfiche. Report ORNL-4634, Feb. 1971. 141 p.

Descriptors: *Ecosystems, *Aquatic habitats, *Animal populations, *Radioisotopes, Terrestrial habitats, Information retrieval, Documentation, Ecology, Radioactivity effects, Systems analysis, Drainage effects, Water pollution effects, Absorption, Forest management, Research facilities, Plant physiology.

The main headings of this report are: (1) Responses of Animal Populations to Ionizing Radiation, (2) Radionuclide Cycling in Terrestrial Ecosystems, (3) Biogeochemical Ecology Information Center, (4) Responses of Plants to Ionizing Radiation, (5) Systems Ecology, (6) Watershed Aquatic Habitat Interactions, (7) Forest Management, (8) Radionuclide Cycling in Aquatic Systems. (Bopp-NSIC)
W71-09194

THE CRITICAL THERMAL MAXIMUM OF JUVENILE SPOT, LEIOSTOMUS XANTHURUS, LACEPEDE,
North Carolina State Univ., Raleigh. Dept. of Zoology.
David Wilder Bridges.
Available from UNC-WRRI, North Carolina State University, Raleigh, North Carolina 27607: Price - $2.50. Available from the National Technical Information Service as PB-200 263, $0.95 in microfiche. Report No 43, UNC-WRRI, N. C. State University at Raleigh, Publication No 17, Pamlico Marine Laboratory, Jan 1971. 39 p, 5 fig, 5 tab, 34 ref, append. OWRR Project B-004-NC (9).

Descriptors: *Thermal pollution, *Water pollution effects, *Water quality, *Standards, *Water temperature, *Fish physiology, Cooling water, Heated water, Fishkill, Electric power plants, Temperature, Juvenile fishes, *Juvenile growth stage.
Identifiers: Critical thermal maximum.

The Critical Thermal Maximum (CTM) of juvenile spot was determined throughout their first growing season from the time they entered the oligohaline environment until they left it. Spot were acclimated in the laboratory to combinations of temperature and salinity levels prior to the CTM tests. When the data were analyzed by multiple regression, acclimation temperature, acclimation salinity, weight, weight squared, and length were all found to be significantly important influences on the CTM of juvenile spot. Temperature was the most important influence on CTM with an R2 value of 0.92. Salinity was the least important with an R2 of 0.001, and weight, weight squared and length were all intermediate influences with R2 values of about 0.18. Response surfaces were generated from the prediction equation showing the acclimation temperature necessary to produce a fixed CTM for juvenile spot. These reveal that CTM increases with size (either length or weight) and age during the nursery period. The increase in CTM was somewhat greater between summer and fall sized spot than between spring and summer sized spot. The CTM increased as salinity increased. (Howells-North Carolina)
W71-09212

MIGRATION AND METABOLISM IN A STREAM ECOSYSTEM,
North Carolina Univ., Chapel Hill. Dept. of Zoology; and North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 05A.
W71-09213

ECOLOGY AND POLLUTION OF THE ENVIRONMENT (in French).

Bulletin d'Informations Scientifiques et Techniques, No 151, p 3-73 (Sept 1970).

Descriptors: *Strontium radioisotopes, *Water pollution effects, Nuclear wastes, Rivers, Absorption, Fish, Mollusks, Marine animals, Cobalt radioisotopes, Food chains, Irrigation, Flow profiles, Marine algae, Winds, Sea water, Physicochemical properties.

Identifiers: *Cesium radioisotopes, *Ruthenium radioisotopes, Zirconium radioisotopes.

A collection of articles which includes the following topics: Plants and Particulate Atmospheric Pollution (Wind Tunnel Experiments), Uptake of Radionuclides by Marine Biota, In-Situ Contamination of Marine Biota by Ruthenium-106 and Zirconium-95, Physicochemical Behavior of Ruthenium in Sea Water, A Cesium Source for Irradiation Studies of Marine Organisms, Simulation of Natural Flow in River Pollution Studies, Migration of Fission Products through Soil, Uptake of Radionuclides by Vegetables from Irrigation Water. (Bopp-NSIC)
W71-09225

THE RAIN FOREST PROJECT. ANNUAL REPORT,
Puerto Rico Univ., Rio Piedras.
Carl F. Jordan, and George E. Drewry.
Available from USAEC Depository Libraries. Atomic Energy Commission Technical Report, PRNC-129, Dec 31, 1969. 144 p. Contract AT (40-1)-1833.

Descriptors: *Tritium, *Radioisotopes, *Tracking techniques, Fallout, Ecosystems, Rain forests, Strontium radioisotopes, Zinc radioisotopes, Radioecology.
Identifiers: Cesium radioisotopes, Manganese radioisotopes, Rubidium radioisotopes, Zirconium radioisotopes, Cerium radioisotopes.

The ecology and radionuclide transport were studied for a tropical rain forest with an elevation of 1500 feet in eastern Puerto Rico. Contents of calcium, copper, iron, potassium, magnesium, manganese, sodium, and phosphorus in various compartments of the ecosystem were determined from contents in leaves, bark, roots, litter, organic matter in the forest and biomass of the soil. Rates of movement of each element were related to rainfall and season. Fallout distribution was studied in terms of species, site, canopy, and presence of epiphylls on leaves. Cerium-144, cesium-137, and zirconium-95 were used as tracers. The movements of injected cesium-137, manganese-54, rubidium-86, and strontium-85 through various species of trees was followed. Tritium transport was studied in a plot to which tritiated water was applied by simulated rainfall. Runoff water was collected both beneath the litter and to a depth of five inches in the soil. A pulse of tritium was injected into a tree and the quantities determined: (1) time for tritium to reach the canopy, (2) residence half life of tritium in the free water, and (3) amount of tritium bound in the leaves by photosynthesis. The amount of tritium lost by evaporation from the soil was also determined. Ecological data is presented for plants within an area subjected to gamma irradiation in 1965. (Bopp-NSIC)
W71-09226

RADIONUCLIDE CYCLING IN NATURAL POPULATIONS OF AMPHIBIANS. ANNUAL PROGRESS REPORT, JUNE 16, 1969-JUNE 15, 1970,
Oregon State Univ., Corvallis.
David L. Willis.
Atomic Energy Commission Technical Report, RLO-2093-2, 1970. 3 p.

Descriptors: *Newts, *Absorption, *Radioisotopes, Cobalt radioisotopes, Zinc radioisotopes, Iodine radioisotopes, Water pollution effects, Temperature.
Identifiers: Manganese radioisotopes, Sulfur radioisotopes, Rubidium radioisotopes, Cesium radioisotopes.

Uptake and retention of radionuclides by newts was studied (manganese-54, cobalt-60, zinc-65, sulfur-85, rubidium-86, iodine-131, and cesium-134). The equilibrium value for cesium uptake from water was approached after 50 days. Component biological half lives of cesium were 9.6 and 42.8 days at 23 deg C, and 53.8 days (a single component) at 10 deg C. Cesium concentration was highest in the soft tissue. The equilibrium manganese uptake was approached in one month. After 16 days manganese was equally partitioned between skeletal muscle, skin, bone, and liver. Long-term biological half lives after acute administration were: 114 days for cobalt, 1260 days for zinc, 131 days for strontium, and 210 days for iodine. (Bopp-NSIC)
W71-09227

USSR REPORTS ON RADIOACTIVITY IN MAN AND THE ENVIRONMENT.
New York Operations Office (AEC), New York.

Available from NTIS. Atomic Energy Commission Technical Report, AEC-tr-7214, 1970. 308 p.

Descriptors: *Radioisotopes, *Absorption, *Food chains, Water pollution effects, Path of pollutants, Fallout, Milk, Ecology, Water pollution control, Control, Radioactivity effects, Surface waters, Soil contamination.

Translations of 39 reports give a substantial coverage of the various aspects of concentration of radioactivity in air, surface water, soils, vegetation, and man; including pathways and distribution in the environment. (Bopp-NSIC)
W71-09228

EVALUATION OF RADIOACTIVE POLLUTION TRANSFER TO OCEAN AND SEA FOOD CHAINS (in French),
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).
R. Bittel, and G. Lacourly.
Available from NTIS. Comissariat a l'Energie Atomique Conference Report, CEA-CONF-1465, 1969. 26 p.

Descriptors: *Food chains, *Radioisotopes, *Absorption, Water pollution effects, Control, Sea water, Human population, Public health, Water pollution control, Strontium radioisotopes, Foreign research, Nuclear wastes.
Identifiers: Cesium radioisotopes.

A research program is outlined to determine parameters needed to estimate the radioactivity ingested from seafood in the diet. (Bopp-NSIC)
W71-09229

LEVEL OF RADIOACTIVE CONTAMINATION IN THE ENVIRONMENT AND IN THE FOOD CHAIN. ANNUAL REPORT, 1968 (in French).
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France).

Available from NTIS. Euratom Report, EUR-4411 f, Sept 1969. 62 p.

Descriptors: *Food chains, *Radioisotopes, *Absorption, Strontium radioisotopes, Nuclear wastes, Fallout, Water pollution effects, Water pollution control, Control, Iodine radioisotopes, Metabolism, Public health.
Identifiers: Cesium radioisotopes.

Research is reported concerning the radioactive contamination of the environment and of food chains. (Bopp-NSIC)
W71-09230

A SELECTED BIBLIOGRAPHY OF TERRESTRIAL, FRESHWATER AND MARINE RADIATION ECOLOGY,
Washington State Univ., Pullman; and Colorado State Univ., Fort Collins.
Vincent Schultz, and F. Ward Whicker.
Available from NTIS. Atomic Energy Commission Report, TID-25650, 1971. 185 p.

Descriptors: *Radioecology, *Terrestrial habitats, *Sea water, *Fresh water, Radioactivity effects, Radioisotopes, Water pollution effects, Wildli Documentation, Fallout, Nuclear wastes, Metab ism, Animal metabolism, Nutrient requiremen Tracers, Bibliographies.

Includes radiation effects or metabolic studies i volving radionuclides on wild species of plants a animals. Studies of laboratory or domestic orga isms are included when the studies are of ecological nature, e.g., on population growth synergistic. Studies of soils or of the atmosphe are not included. The references are arrang alphabetically by author under 18 headings (I troduction, Status and Needs of Radiation Ecolog etc. There is no subject index. In 1969 and partic larly 1970, the coverage has not been complete (Bopp-NSIC)
W71-09232

NATURAL ENVIRONMENTAL RADIOACTIVITY. AN ANNOTATED BIBLIOGRAPHY,
Nevada Operations Office (AEC), Las Vegas.
Alfred W. Klement, Jr.
Available from NTIS. Atomic Energy Commissi Technical Report, WASH-1061 (Suppl), A 1970. 72 p.

Descriptors: *Radioisotopes, *Radioactivity, *S contamination, *Water pollution, Air pollutio Radioactivity effects, Water pollution effects, A pollution effects, Soil contamination effects, A sorption.

This supplement to WASH-1061 includ references obtained since July 1965 on the topic general, atmosphere, biological materials, soi waters, and groundwater. Nuclear Science A stracts and Chemical Abstracts were the maj sources of reference. (Bopp-NSIC)
W71-09234

EFFECT OF COBALT ON SEA URCHI MORPHOGENESIS,
California Univ., Livermore. Lawrence Radiati Lab.
Mary M. Barrett, and Hector Timourian.
Available from NTIS. UCRL-50717, July 16, 196 7 p.

Descriptors: *Invertebrates, *Cobalt, *Patholog Sea water, Embryonic growth stage, Toxicit Water pollution effects, Resistance, Radioactivi techniques, Cobalt radioisotopes.

Cobalt uptake contrasted with that of zinc sin cobalt appeared to remain in equilibrium with t exterior source, and could be washed out. S urchin embryos removed from cobalt solutio after 24 hour exposure were capable of norm development. At low concentrations of cobalt artificial sea water, 10 to the minus 4th power to t to the minus 5th power molar, the effects of cob were mainly on the skeletal structures. Uptake cobalt-60 did not take place during the ear cleavage stages and reached an equilibrium at hours. (Bopp-NSIC)
W71-09239

INSTRUMENTATION RESEARCH FOR RADI TION MEASUREMENTS IN THE MARINE E VIRONMENT,
Scripps Institution of Oceanography, La Jol Calif.
T. R. Folsom.
Available from NTIS as AD-704 877. SIO REF 7 15, Apr 1970. 22 p, 45 ref.

Descriptors: *Radioisotopes, *Oceanograph *Sea water, Fallout, Programs, Bibliographies, I strumentation, Ocean circulation, Water pollutio effects, Radioactivity techniques.
Identifiers: *Cesium radioisotopes.

New methods for surveying fallout constituent particularly cesium-137, have led to informatio about the Pacific Ocean, especially its shallow

yers. Further study of the long persistence of ater properties near 100 meters seems desirable. bstracts of reports and journal articles from the stitute of Marine Resources during the past 6 ars are appended. (Bopp-NSIC)
71-09242

PTAKE OF NITROSYL RUTHENIUM-106 ON HITIN AND CHITOSAN FROM WASTE SOLUIONS AND POLLUTED SEA WATER,
ologna Univ. (Italy).
A. A. Muzzarelli.
ater Research, Vol 4, no 6, p 451-455, June 70.

escriptors: *Nuclear wastes, *Waste water treatent, *Water pollution control, Absorption, adioecology, Radioactivity techniques, Chelaon, Crabs, Chromatography.
entifiers: *Ruthenium radioisotopes.

hitin and chitosan, two polymers obtained from ab shells, are proposed as chromatographic supprts for collection of nitrosyl ruthenium-106 from aters contaminated by nuclear wastes. The olymers can also find application for the pollution rvey of sea water. (Bopp-NSIC)
71-09246

HE OCEANS - WORLD SUMP,
regon State Univ., Corvallis.
W. Hedgpeth.
vironment, Vol 12, No 3, p 40-47 (Apr 1970). 3 , 17 ref.

escriptors: *Water pollution sources, Radioisotopes, *Thermal pollution, Nuclear astes, Ecology, Oceans.

he capacity of the oceans for absorbing wastes is nited. Continuing to seek solutions to waste sposal problems which involve merelymanipulaon of the environment is borrowing time that does t exist. The only ultimate solution is to reduce e impact of people on the environment.
71-09247

EMPERATURE EFFECTS ON THE SORPTION F RADIONUCLIDES BY FRESHWATER ALAE,
vannah River Lab., Aikan, S.C.
S. Harvey.
ealth Physics, Vol 19, No 2, p 293-297 (Aug 70). 4 fig, 3 tab, 7 ref.

escriptors: *Aquatic algae, *Radioisotopes, Abrption, Temperature, Strontium radioisotopes, nc radioisotopes, Cobalt radioisotopes, Water llution effects, Fresh water.
entifiers: *Cesium radioisotopes, Iron dioisotopes, Manganese radioisotopes.

ater temperatures of 23-32 deg C did not affect e sorption of cesium-137, strontium-85, zinc-65, n-59, cobalt-57, and manganese-54 by the filaentous green alga, stigeoclonium lubricum. adionuclide concentrations in the unicellular atom, navucila seminulum, were 2-5 times higher 32 deg C than at 23 deg C. Water temperatures 25-40 deg C had no significant effect on the rption of cesium-137, strontium-85, zinc-65, and n-59 by the filmentous blue-green alga, plecnema boryanum. However, cobalt-57 concentraons in P. boryanum decreased with temperature, d manganese-54 concentrations increased from -35 deg C. Growth of S. lubricum was not afcted by the temperature. (Bopp-NSIC)
71-09250

ARIEN GASTROPOD POLYCLAVE (BIOENRONMENTAL AND RADIOLOGICALAFETY FEASIBILITY STUDIES. ATLANTICACIFIC CANAL),
ttelle Memorial Inst., Columbus, Ohio.
mes A. Duke.
Available from NTIS. Betelle Technical report. BMI-171-35, Mar 1970. 75 p.

Descriptors: *Gastropods, *Canals, Pacific Ocean, Atlantic Ocean, Tropical regions, Feasibility studies, Ecology, Competition, Documentation, Estuaries, Fresh water.

An ecological study of gastropods (snails) was conducted in connection with feasibility studies for the proposed sea-level canal. An inverted index is presented to the occurrence of various taxonomic and ecologic attributes of the genera of gastropods found or expected in the littoral, estuarine, freshwater, and terrestrial ecosystems of Panama. Feeding habits and transport of gastropods through the proposed canal are discussed with relation to their ecological significance. (Bopp-NSIC)
W71-09251

DARIEN PELECYPOD POLYCLAVE (BIOENVIRONMENTAL AND RADIOLOGICALSAFETY FEASIBILITY STUDIES. ATLANTICPACIFIC CANAL),
Battelle Memorial Inst., Columbus, Ohio.
James A. Duke.
Available from NTIS. Batelle technical report BMI-171-36, Apr 1970. 43 p.

Descriptors: *Mollusks, *Canals, Pacific Ocean, Atlantic Ocean, Tropical regions, Feasibility studies, Ecology, Competition, Documentation, Information retrieval.

An ecological study of pelecypods (mollusks) was conducted in connection with feasibility studies for the proposed sea-level canal. An overlay information-retrieval system for taxonomic identification of 300 genera of pelecypods is presented. The data indicate that pelecypods are insignificant as potential hazards if introduced into the opposite side of the isthmus and that important food species in the isthmian region would not be endangered by transit of pelecypods. (Bopp-NSIC)
W71-09252

RADIOECOLOGICAL STUDIES OF TRITIUM MOVEMENT IN A TROPICAL RAIN FOREST. THE PROCEEDINGS OF THE SYMPOSIUM ON ENGINEERING WITH NUCLEAR EXPLOSIVES, LAS VEGAS, NEVADA, JAN. 14-16, 1970,
California Univ., Levermore. Lawrence Radiation Lab.
J. R. Martin, C. F. Jordan, J. J. Koranda, and J. R. Kline.
Available from NTIS. Atomic Energy Commission Conference Proceedings CONF-700101- (Vol 1).

Descriptors: *Tritium, *Absorption, *Rain forest, Puerto Rico, Tracers, Ecosystems, Plant growth, Runoff, Soil contamination, Nuclear explosions, Water pollution effects, Soil contamination effects.

Several experiments on the movement of tritium were conducted in a montane rain forest of eastern Puerto Rico. Tritiated water was used as a tracer for water movement in mature evergreen trees of the rain forest, soil and substory vegetation, and rapidly growing species. Based on all experimental data, the distribution of tritium from a simulated rainout following a one megaton thermonuclear detonation is presented. (Bopp-NSIC)
W71-09253

THE EFFECTS OF ENVIRONMENTAL STRESS ON THE COMMUNITY STRUCTURE AND PRODUCTIVITY OF SALT MARSH EPIPHTIC COMMUNITIES,
City College, New York.
J. J. Lee.
Available from NTIS. Atomic Energy Commission Technical Report NYO-3995-14, Jan 1970. 46 p.

Descriptors: *Ecosystems, *Salt marshes, *Productivity, Radioisotopes, Strontium radioisotopes, Algae, Plant growth, Temperature, Protozoa, Chlorophyta, Absorption.

The following topics are considered: Removal of calcium-45 and strontium-89, -90 from coastal environments by calcareous foraminifers (protozoa); Growth and reproduction of foramifers and epiphytic algae; Effect of temperature and light on enteromorpha (algae) and its epiphytes; Stimulation of growth of 9 out of 11 representative eipihytic algae by either arginine or alanine; and Progress in other subprojects. (Bopp-NSIC)
W71-09254

MECHANISMS OF RADIOECOLOGICAL CONCENTRATION PROCESSES IN SEAS AND OCEANS,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
G. G. Polikarpov.
Available from NTIS. Atomic Energy Commission translation AEC-tr-7030, (1969), p 49-64.

Descriptors: *Marine animals, *Marine plants, *Radioisotopes, Water pollution effects, Absorption, Food webs, Sea water, Oceans, Plankton, Phaeophyta, Programs, Radioecology.

Concentration of radionuclides in food webs is discussed. Similarities in uptake between related species are significant for extrapolation of data, and effects of parameters (salinity, concentration in sea water) are considered. Radioecology programs at the author's research institute are discussed. (Bopp-NSIC)
W71-09255

SOME OBSERVATIONS ON ALGAE INVADING A CESIUM-137 CONTAMINATED POND,
Atomic Energy of Canada Ltd., Pinawa (Manitoba).
Janet R. Dugle, and J. E. Guthrie.
Available from NTIS. Atomic Energy of Canada technical report AECL-3463, (1970). 12 p.

Descriptors: *Aquatic algae, *Radioactivity effects, *Ponds, Water pollution effects, Radioisotopes, Competition, Speciation.
Identifiers: *Cesium radioisotopes.

A comparison of the species of algae found at various collection sites within two ponds, one contaminated with cesium-137, was made in October 1968. These observations will form the basis of a study of the succession of algal species in pond communities. (Bopp-NSIC)
W71-09256

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES,
Quirk, Lawler, and Matlsky Engineers, New York.
Karin A. Abood, John P. Lawler, and M. D. Disco.
Available from NTIS. Atomic Energy Commission technical report NYO-3961-1, Aug 1969. 197 p.

Descriptors: *Tracers, *Flow characteristics, *Radioisotopes, River flow, Estuaries, Dispersion, Radioactivity techniques.

A general procedure for a tracer field survey has been developed which is suitable for measurement of dispersion and flow characteristics in freshwater rivers and estuaries. Radiotracers appear to meet the technical requirements of an ideal tracer better than other materials; however nontechnical aspects have hindered adoption of radioisotope techniques. (Bopp-NSIC)
W71-09257

THE ADHESIVE PROPERTIES OF 'CHLORELLA VULGARIS',
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
Thomas R. Tosteson, and Luis R. Almodovar.

Available from the National Technical Information Service as AD-721 114, $3.00 in paper copy, $0.95 in microfiche. ONR technical report, no. TR-1, Apr. 1971, 35 p.

Descriptors: *Chorella, *Algae, *Fouling, *Nuisance algae, Floating plants, Seawater, Plankton, Biodegradation, Light, Temperature.
Identifiers: Acrylic resins, Glass, Thymidines, Cells (Biology), *Biodeterioration, Democolcine.

Ambient sea water contains material that promotes the adhesion of the planktonic algae Chlorella vulgaris to plastic surfaces. This adhesion takes place within 3 tp 6 hours, and is inhibited by the absence of light. The effect of light on the response of Chlorella to the ocean treated surface is due to the effect of light on the rate of growth of the algae population. The adhesion of Chlorella to glass surfaces is significantly increased in the presence of thymidine and colcemide. Thymidine accelerates the rate of growth of the algal cells and colcemide blocks this growth during mitosis. The effect of ocean deposited materials on the adhesion of Chlorella to plastic appears similar to the effect of agents that increase the relative number of cells to the G2 phase of the cell cycle on the adhesion of this cell to glass.
W71-09261

SYMPOSIUM ON ENVIRONMENTAL LEAD CONTAMINATION, HELD ON DECEMBER 13-15, 1965.
Public Health Service, Washington, D.C.

Available from the National Technical Information Service as PB-198 104, $3.00 in paper copy, $0.95 in microfiche. Public Health Service Publication no 1440, Mar 1966.

Descriptors: *Water pollution, *Water pollution effects, *Air pollution, *Public health, Toxicity, Water quality control, Industrial wastes, Diets.
Identifiers: *Lead, Toxicology, Tetraethyl lead, Antiknock additives, Food contamination, Exhaust gases, Combustion products, Air pollution effects.

The ways by which lead enters the environment are examined. The effects of lead on human health are discussed. Measures which may be needed to minimize the effects are explored. Included are reports on: Estimation of Sources of Atmospheric Lead and Measured Atmospheric Lead Levels; The Diet as a Source of Lead in Drinking water; Recent History of Lead Exposure in U.S. Industry, 1935-1965; Under What Circumstances is Inhalation of Lead Dangerous; Under What Circumstances is Ingestion of Lead Dangerous; Under What Circumstances is Direct Contact With Lead Dangerous; How Sensitive and How Appropriate are our Current Standards of 'Normal and Safe' Body Content of Lead; Possibilities of Removal of Sources of Lead Contamination in the Environment; Evaluation of Use vs. Non-use of Tetra-ethyl Lead in Gasoline; Refining to Produce Gasolines of Reduced Lead Content.
W71-09264

CHANGES IN THE CHEMICAL COMPOSITION OF SEDIMENTS OF LAKE WASHINGTON, 1958-1970,
Minnesota Univ., Minneapolis. Limnological Research Center; and Washington Univ., Seattle. Dept. of Zoology.
For primary bibliographic entry see Field 05B.
W71-09281

FORMATION OF METHYL MERCURY FROM PURE MERCURIC SULPHIDE IN AEROBIC ORGANIC SEDIMENT,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 05B.
W71-09296

POLLUTION PROBLEMS IN THE 'OIL PATCH',
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-09303

STUDIES ON THE RADIOACTIVE CONTAMINATION OF THE SEA,
European Atomic Energy Community, Brussels (Belgium); and Comitato Nazionale per l'Energia Nucleare, Bologna (Italy).
M. Bernhard.
Available from Office for Official Publications of the European Communities, PO Box 1003, Luxembourg/gare 37, rue Glesener, Luxembourg. Studies on the Radioactive Contamination of the Sea, European Atomic Energy Community and Comitato Nazionale Per L'Energia Nucleare, Annual Report 1968-69, 1971. 109 p, 4 fig, 3 tab, 25 ref. EUR 4508e, CNEN Report No RT/BIO (70)-11, Association No 074-69-1 BIAI.

Descriptors: *Oceans, *Radioactivity, *Water pollution, *Environment, *Chemistry, *Food chains, *Biology, Microorganisms, Fisheries, Radioisotopes, Absorption.
Identifiers: *Trophic levels, *Heterotrophic levels.

The factors which influence the uptake, accumulation and loss of radioisotopes by different inorganic and organic constituents of the marine environment are studied. A survey of environmental elements and factors in a sampling area was made and experiments on the influence of environmental factors on the uptake, accumulation and loss of radioisotopes by different inorganic and organic constituents of the marine environment in relation to the data obtained in the survey were conducted. (Ensign-PAI)
W71-09366

A MODULAR CONTROLLED-TEMPERATURE APPARATUS FOR FISH EGG INCUBATION AND FRY REARING,
Federal Water Quality Administration, Duluth, Minn. National Water Quality Lab.
For primary bibliographic entry see Field 05A.
W71-09368

EFFECT OF TEMPERATURE AT DIFFERENT ALTITUDES ON THE EMERGENCE OF AQUATIC INSECTS FROM A SINGLE STREAM,
Federal Water Quality Administration, Duluth, Minn. National Water Quality Lab.
Alan V. Nebeker.
Journal of the Kansas Entomological Society, Vol 44, No 1, p 26-35, Jan 1971. 1 fig, 12 tab, 4 ref.

Descriptors: *Aquatic insects, *Stoneflies, *Water temperature, *Photoperiodism, Larvae, Growth stages, Inhibition, Utah, Light duration.
Identifiers: *Insect emergence, Plecoptera, Brachyptera sp., Capnia sp., Leuctra sp., Eucapnopsis sp., Nemoura sp., Perlomyia sp., Development.

The effects were analyzed of temperature as influenced by altitude on the seasonal distribution and adult emergence of 13 winter stoneflies (Plecoptera) in a single stream. Water temperature of the stream, when modified by the air temperature, solar insolation, snow cover and springs, produced significant changes in insect emergence patterns. Three main types of emergence patterns are apparent: (1) where the temperature is the main influence on the time emergence occurs, even though photoperiod may be the initial stimulus; (2) where photoperiod is the main regulation; and (3) where the photoperiodic stimulus is modified--emergence occurs at about the same time in most of the canyon but is delayed by colder temperatures at the high elevations. (LeGore-Washington)
W71-09370

AN ELECTRODE CHAMBER FOR RECORDING RESPIRATORY AND OTHER MOVEMENTS OF FREE-SWIMMING ANIMALS,
Federal Water Quality Administration, Duluth, Minn; and Cincinnati Univ, Ohio, Dept. of Biological Science.
W. A. Spoor, T. W. Neiheisel, and R. A. Drummond.
Transactions of the American Fisheries Society, Vol 100, No 1, p 22-28, Jan 1971. 5 fig, 19 ref. FWPCA Grant No WP-01317-01.

Descriptors: *Bioassay, *Analytical techniques, *Fish physiology, *Water pollution effects, *Methodology, Laboratory animals, Fish behavior, Fish diseases, Environmental effects, Laboratory equipment, Laboratory tests, Monitoring.
Identifiers: *Physiological monitoring, *Experimental physiology, Laboratory recording equipment, Experimental designs.

By their effects on equilibrium potentials, water currents produced by respiratory and other movements of freely-moving animals cause changes in the potential difference between stainless steel electrodes set at opposite ends of an open system continuous-flow animal chamber. The changes are in the microvolt range, but they can be used for continuous or intermittent recording of the animal's responses in short-term or long-term studies inder widely varied environmental conditions, and the method seems suitable for monitoring. Sensitivity of the apparatus was tested. Variations in dissolved oxygen from less than 0.2 ppm to saturation, in free CO2 concentration from 0.0 to 30.. ppm, in temperature from 0 to 30C, and in pH from 3 to 11 are not limiting. (LeGore-Washington)
W71-09372

CARBAMATE BIOASSAY USING DAPHNIA MAGNA,
Cornell Univ., Ithaca, N.Y. Dept. of Entomology.
For primary bibliographic entry see Field 05A.
W71-09373

ABOUT THE MAXIMUM PERMISSIBLE POLLUTION OF SURFACE WATERS BY OIL AND OIL PRODUCTS OWING TO THEIR EFFECT ON THE WATER FAUNA AND ON THE ORGANOLEPTIC PROPERTIES OF WATER (IN CZECH),
Vyskumny Ustav Vodohospodarsky, Bratislava (Czechoslovakia).
Josef Rothschein.
German and English summaries. Vyskumny Ustav Vodncho Hospodarstva Bratislava, Informacie 26, 1970. 59 p, 12 fig, 15 tab, 35 ref.

Descriptors: *Oily water, *Gasoline, *Bioassay, *Water pollution effects, *Organoleptic properties, *Impaired water quality, Oil, Oil wastes, Water pollution sources, Lethal limit, Fish, Daphnia, Oligochaetes, Aquatic environment, Fish, Odor, Potable water, Water quality.
Identifiers: *Oil pollution, *Refinery wastes, Oil spills, Oil products.

Fish, oligochaetes (Tubifex), and Daphnia were used to determine the toxicity of desalted crude oil, 'gas oil,' petroleum, gasoline, and waste water from fuel processing. Daphnia were the most sensitive to the above products, fish next, and oligochaetes were most tolerant. Toxicity depended to a large degree on the ability of the product to emulsify in water. The odor threshold of the substances in water ranged from 1/2 to 1/10 of their lethal values, and it is very difficult to produce potable water from a stream receiving refinery wastes. (Katz and LeGore-Washington)
W71-09374

EFFECTS OF HYPOXIA UPON RESPIRATION AND CIRCULATION IN THE DOGFISH SCYLIORHINUS STELLARIS,
Max-Planck-Institut fuer Experimentelle Medizin, Goettingen (Germany). Dept. of Physiology.
J. Piiper, Doris Baumgarten, and M. Meyer.

mparative Biochemistry and Physiology, Vol 36, 513-520, 1970. 2 tab, 19 ref.

escriptors: *Fish physiology, *Dissolved oxygen, Elasmobranches, *Sharks, *Respiration, *Circution (Animals), Environmental effects, Oxygen g, Fish behavior, Oxygen demand, Oxygen quirements.
entifiers: *Hypoxia, Dogfish, Heart rate, Cardiac tput, Blood pressure, Oxygen consumption.

hanges in respiration and circulation induced by poxia were studied in the dogfish, Scyliorhinus ellaris, by reducing the oxygen pressure in ament water from 142 mm Hg to 54 mm Hg. The folwing changes were observed: (a) O2 uptake ecreases markedly, (b) respiratory rate did not ange significantly, but the ventilation rate inreased, showing a maximum at moderate hypoxia,) heart rate decreased, and cardiac output meared according to the Fick principle also showed a ght tendency to decrease, and (d) mean blood essure in the ventral aorta and in peripheral artees decreased. The effects of hypoxia are mostly in reement with those found in other asmobranchs, but differ in many respects from anges observed in teleosts. (LeGore-Washingn)
71-09375

EPORT ON A FISH KILL AT LAGUNA JOYUA, WESTERN PUERTO RICO, IN THE UMMER, 1967,
uburn Univ., Auburn, Alabama, and Florida State niv., Tallahassee, Dept. of Oceanography.
ancisco A. Pagan, and Herbert M. Austin.
aribbean Journal of Science, Vol 10, Nos 3-4, p 3-208, Sept-Dec 1970. 2 fig, 1 tab, 1 ref.

escriptors: *Fishkill, *Mortality, *Dissolved oxen, *Oxygen sag, *Salinity, *Environmental efcts, *Water temperature, Crabs, Shrimp, oughts, Water quality, Physiological ecology, Cliatology, Puerto Rico.
entifiers: *Natural mortality, Laguna Joyunda uerto Rico).

mass mortality which occurred in Laguna Joyun, Puerto Rico, on June 7, 1967, was investigated. veral species of fish, the blue crab (Callinectes .) and one species of peneid shrimp were killed. gh air temperatures and severe drought were ncluded to have interacted with high levels of ght plant respiration, resulting in rapid water aporation, high salinity (to 43-44 ppt), low disved oxygen values (less than 0.5 ppm) and high ater temperature (35 C). The mortality was emed to have been caused by natural enomena. The situation is compared with a nilar mortality that occurred in Laguna Joyuda in 63. (LeGore-Washington)
71-09376

SH-TOXICITY PROBLEMS OF PESTICIDES JAPAN - THE PRESENT SITUATION AND HE POLICIES OF THE MINISTRY OF GRICULTURE AND FORESTRY,
gricultural Chemical Inspection Station, Tokyo apan).
r primary bibliographic entry see Field 05A.
71-09377

FFECT OF SESAMEX ON BRAIN CETYLCHOLINESTERASE INHIBITION BY ARATHION IN FISHES,
ississippi State Univ, State College, Dept. of ology.
mes R. Gibson, and J. Larry Ludke.
lletin of Environmental Contamination and Toxology, Vol 6, No 2, p 97-99, 1971. 1 tab, 8 ref.

escriptors: *Organophosphorous pesticides, Toxicity, *Biochemistry, *Pesticide toxicity, Fish physiology, Inhibition, Bioassay, Inhibitors, nzymes, Sunfishes, Lepomis species, Shiners, uegills, Pathology, Water pollution effects, ater pollution treatment, Pesticides.
Identifiers: *Sesamex, *Parathion, Toxic mechanisms, Mechanisms of toxicity, Brain, Acetylcholinesterase, Golden shiner, Notemigonus sp., Nervous tissue.

The toxic action of parathion is generally considered to result from inhibition of acetylcholinesterase (AChE). Sesamex is a suspected antagonist to this toxic mechanism. This was tested using brain AChE from golden shiners (Notemigonus chrysoleucas), green sunfish (Lepomis cyanellus) and bluegill sunfish (Lepomis macrochirus). Experiments indicated that the degree of brain AChE inhibition resulting from exposure to parathion is decreased by pretreatment of fish with sesamex. The decrease is presumably mediated through inhibition of the enzyme that converts parathion to the potent anticholinesterase, paraoxon. (LeGore-Washington)
W71-09378

SENSITIVITY TO PESTICIDES IN THREE GENERATIONS OF SHEEPSHEAD MINNOWS,
Bureau of Commercial Fisheries Center for Estuarine and Menhaden Research, Gulf Breeze, Florida, Pesticide Field Station.
Hugh T. Holland, and David L. Coppage.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 4, p 362-367, 1970. 1 fig, 1 tab, 3 ref. Gulf Breeze Contribution No. 76.

Descriptors: *DDT, *Endrin, *Chlorinated hydrocarbon pesticides, *Toxicity, *Fish genetics, *Water pollution effects, Bioassay, Lethal limit, Minnows, Fish physiology, Fish reproduction, Pesticide toxicity, Fish management, Resistance, Fish populations, Balance of nature, Environmental effects, Fecundity, Persistence.
Identifiers: *Natural selection, Fish breeding, Sheepshead minnows, Cyprinodon sp.

An attempt was made to determine whether succeeding generations of sheepshead minnows (Cyprinodon variegatus) exposed to DDT can develop resistance to DDT, and whether 'cross-resistance' to endrin, a related insecticide, can develop. Static bioassays were utilized. Sensitivity to DDT varied with time of year in both control and experimental generations. Sensitivity did not decrease consistently in any experimental generation, but all decreases observed occurred during the interval March-June. (LeGore-Washington)
W71-09379

INTERACTION OF PESTICIDES WITH AQUATIC MICROORGANISMS AND PLANKTON,
Arizona Univ, Tucson, Dept. of Entolmology.
George W. Ware, and Clifford C. Roan.
Summaries in English, French and German. Residue Reviews, Vol 33, p 15-45, 1971. 16 tab, 84 ref.

Descriptors: *Reviews, *Bibliographies, *Data collections, *Pesticides, *Organo-phosphorous pesticides, *Chlorinated hydrocarbon pesticides, *Herbicides, *Pesticide toxicity, *Water pollution effects, *Plankton, *Aquatic microorganisms, Organic pesticides, Insecticides, Toxicity, Lethal limit, Pesticide kinetics, Pesticide residues, Zooplankton, Phytoplankton.

A review is presented of the literature relative to the effects of several pesticides on both zoo- and phytoplankton. Considered are: the introduction of pesticides into the aquatic environment, pesticide toxicity, freshwater and marine microorganisms, organochlorine and organophosphate insecticides, and herbicides. The contrasts in interpretation of toxicity data are discussed and a few possible explanations for this variation are suggested. A table indicating the chemical designations of 81 pesticides is provided. (LeGore-Washington)
W71-09381

THE EFFECTS OF WATER HARDNESS ON THE UPPER LETHAL TEMPERATURE OF THE GREEN SUNFISH (LEPOMIS CYANELLUS),
New Mexico State Univ., University Park.
Thomas Oliver Boswell.
MS Thesis, July, 1967. 31 p, 4 fig, 4 tab, 28 ref. OWRR Project A-003-N MEX (2).

Descriptors: *Hardness (Water), *Lethal limit, *Water temperature, *Sunfishes, *Lepomis species, Water properties, Water quality, Temperature, Heated water, Thermal pollution, Heat resistance, Bioassay, Acclimatization, Environment, Physiological ecology.
Identifiers: Green sunfish, LD-50, Nerve function.

The effects of water hardness on the upper lethal temperature of the green sunfish were examined. Fish were acclimated and tested at hardness levels of 30, 180 and 400 ppm, and the 48 hr median upper lethal temperatures and critical thermal maxima were determined for acclimation temperatures of 20C and 30C. The significant effects of water hardness on lethal temperatures were observed. Winter-collected fish exhibited lower levels of thermal resistance than did summer-collected fish. Behavioral evidence supports the hypothesis that heat death in green sunfish results from failure of the nervous system. (Katz and LeGore-Washington)
W71-09382

AN ASSESSMENT OF THE ASSIMILATION OF ELEMENTAL PHOSPHOROUS BY NEWFOUNDLAND MARINE ORGANISMS IN THE 1969 POLLUTION PROBLEM AND IN 1970 MONITORING OPERATIONS,
Fisheries Research Board of Canada, Halifax, (Nova Scotia). Halifax Lab.
For primary bibliographic entry see Field 05A.
W71-09384

THE EFFECT OF PP'-DDT ON TADPOLES OF THE COMMON FROG (RANA TEMPORARIA),
Nature Conservancy, Abbots Ripton (England). Monks Wood Experiment Station.
A. S. Cooke.
Environmental Pollution, Vol 1, p 57-71, 1970. 7 fig, 3 tab, 25 ref.

Descriptors: *DDT, *Water pollution effects, *Frogs, *Resistance, Chlorinated hydrocarbon pesticides, Bioassay, Morbidity, Mortality, Growth, Pathology, Self-purification.
Identifiers: *Rana temporaria, *Tadpoles, DDE.

Tadpoles of the common frog (Rana temporaria L.) were kept for 1 hr in amphibian saline containing 0.01, 0.1, 1.0 or 10.0 ppm pp'-DDT. After treatment in the 0.1, 1.0 or 10.0 ppm DDT media, all tadpoles enter an uncoordinated, hyperactive phase, which can begin after less than 1 hr. This is followed by either a moribund phase and death or by a return to normal activity. Body weight decreases during the hyperactive period, and the development of certain tadpoles is suppressed. Larger tadpoles also become hyperactive during treatment. After treatment, many of these larger tadpoles develop a hole in the snout between the upper mandible and the nostrils, a condition that also retards feeding and development. This abnormal snout reverts to normal after metamorphosis. Smaller tadpoles are more vulnerable to DDT poisoning of the environment. The absolute amount of DDT taken in seems independent of size, so that tissue content is greater for small tadpoles. Rate of loss of pesticide is higher for large tadpoles. In the field, DDT may reduce a frog population by increasing mortality during the larval stage or, more probably, immediately after metamorphosis, or by modifying behavior. Precise evaluation is difficult because of high natural mortality among wild populations. (Katz-Washington)
W71-09385

LAKE ERIE: COMMON EFFORT CAN SAVE IT.
Bureau of Commercial Fisheries, Washington, D.C.

Commercial Fisheries Review, Vol 32, No 8-9, p 19-20, Aug-Sept, 1970. 4 fig.

Descriptors: *Lake Erie, *Lake fisheries, *Fisheries, *Fish management, *Fish populations, *Aquatic environment, *Fish harvest, *Dissolved solids, *Water temperature, *DDT, *Heavy metals, Great Lakes, Market value, White bass, Yellow perch, Lake trout, Fish conservation, Fish food organisms, Fishkill, Pounds fish per acre, Fish populations, Benthic fauna, Dissolved oxygen, Water pollution effects, Rehabilitation, Perches.
Identifiers: *Mercury, Catch statistics, Solids, Climatic changes, Lake rehabilitation.

A general review is given of the fisheries status of the Great Lakes in regard to the effect of environmental changes. There has been a shift in the catch from high value fish to low value fish, such as yellow perch and white bass. Total dissolved solids have increased 50 ppm during the past 50 years. Water temperatures have increased 20F since 1920 due to climate changes. Degradation of the oxygen regime has altered the populations of bottom organisms, which were valuable as fish food. The poundage of fish taken has maintained itself, but the species shift has reduced the value of the catch. DDT values are below 5 ppm, but mercury contamination is serious. The environmental problems of Lake Erie are regarded as complex and discouraging. (Katz-Washington)
W71-09387

CHRONIC ENDRIN POISONING IN GOLDFISH, CARASSIUS AURATUS,
Bureau of Sport Fisheries and Wildlife, Columbia, Mo. Fish-Pesticide Research Lab.
Blake F. Grant, and Paul M. Mehrle.
Journal of the Fisheries Research Board of Canada, Vol 27, No 12, p 2225-2232, 1970. 3 tab, 18 ref.

Descriptors: *Endrin, *Lethal limit, *Pesticide toxicity, *Water pollution effects, *Fish physiology, *Growth rates, *Inhibitors, Food chains, Pesticide residues, Toxicity, Growth, Gonads, Lipids, Mortality, Inhibition, Pesticides, Pathology, Sodium, Osmosis, Fishkill, Public health.
Identifiers: *Goldfish, *Carassius sp., *Chronic pollution, Gonadal development, Thyroid activity, Blood serum, Histopathology, Osmoregulation.

Endrin incorporated into the diet of mature male goldfish for 3-4 months affected growth, gonad development, thyroid activity, serum characteristics, total and differential body fat, behavior and survival. A biphasic response to endrin dosage was characteristic. Low doses (4.3-43.0 ug/kg body weight/day) either caused no detectable effect or were stimulatory, as indicated by increased growth rates and higher total body fat contents. The two highest doses (143 and 430 ug) caused mortality, lowered growth rates, and caused other chronic symptoms. They also caused decreased thyroid cell heights, inhibited game to-genesis, lowered total body fat, and resulted in less vacuolization in liver cells. All doses except the highest caused elevated serum Na concentrations. The fish receiving the highest dose suffered osmoregulatory failure. Induced spermiation was not affected; fish receiving 143 or 430 ug/kg had greatly reduced, but functional testes. (LeGore-Washington)
W71-09388

THE EFFECT OF SIZE ON THE UPTAKE OF DDT FROM WATER BY FISH,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
Philip G. Murphy.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 1, p 20-23, 1971. 2 fig, 6 ref.

Descriptors: *DDT, *Pesticide residues, *Absorption, *Water pollution effects, *Path of pollutants, *Chlorinated hydrocarbon pesticides, Dieldrin, Chromatography, Food chains, Analytical techniques, Bioassay, Fish food organisms, Pesticide kinetics, Pesticide toxicity, Fish physiology.
Identifiers: *Gas-liquid chromatography, *Gambusia affinis, Mosquito fish, DDT-Carbon-14.

Attempts are made to evaluate the intra-specific relationship between body size and DDT uptake in the mosquito-fish, Gambusia affinis. Carbon-14 labelled p,p'-DDT was used in static bioassays. Gas-liquid chromatography determinations of naturally occurring DDT levels in experimental fish were made. The smallest fish were most efficient at removing DDT from water, with the efficiency diminishing rapidly as the fish increased in weight past 200 mg. Direct absorption of DDT from the water may be more important than magnification via the food chain. (LeGore-Washington)
W71-09389

EFFECTS OF SALINITY ON UPTAKE OF DDT, DDE AND DDD BY FISH.
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
Philip G. Murphy.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 5, p 404-407. 1 tab, 9 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Absorption, *Path of pollutants, *Water pollution effects, *Fish physiology, *Salinity, Bioassay, Chromatography, Pesticide residues, Pesticide kinetics, Aquatic environment.
Identifiers: *DDE, *DDD, *Gambusia affinis, Mosquito fish, Gas-liquid chromatography.

The effects were assessed of salinity on the uptake of DDT residues by the mosquito fish (Gambusia affinis) from pesticide concentrations similar to those of environmental waters. Background levels of DDT, DDE and DDD in experimental fish were determined by gas-liquid chromatography. Ethanol solutions of DDT, DDE and DDD were innoculated into static bioassays, in which salinities of 0.15, 10.0 and 15.0 ppt were tested. Accumulation of these compounds was less at 15.0 ppt, and increased salinity apparently had a greater effect on DDT uptake than on uptake of DDE or of DDD. Possible mechanisms of effect are discussed. (LeGore-Washington)
W71-09390

SOIL USE AND WATER QUALITY - A LOOK INTO THE FUTURE,
Agricultural Research Service, Fort Collins, Colo. Soil and Water Conservation Research Div.
Frank G. Viets.
Journal of Agricultural Food Chemistry, Vol. 18, No. 5, p. 789-792, May 1970, 1 table, 21 references.

Descriptors: *Water pollution sources, *Fertilizers, *Nutrient requirements, Economic justification, Cost-benefit analysis.
Identifiers: Agricultural Nitrogen Institute, South Platte Valley, Colorado.

Increasing use of commercial fertilizers is being blamed for substantial eutrophication of surface water and nitrate accumulation in ground water. The author maintains that the available evidence on this subject is circumstantial rather than direct. He explains that bans on or regulations of fertilizer use are not justified on the basis of existing information, but regulation on a local option basis along with other nutrient control measures may be needed when the facts become sufficient. (Holmes-Rutgers)
W71-09419

PHOSPHATES IN DETERGENTS AND THE EUTROPHICATION OF AMERICA'S WATERS.

Available from Sup of Doc, US Government Printing Office, Wash DC 20402 Price $0.40. House Report No 91-1004, twenty-third report by The Comm on Gov't Operations, 91st Cong, 2d Sess (1970). 88 p, 2 fig, 9 tab, 87 ref, 2 app.

Descriptors: *Eutrophication, *Phosphates, *Detergents, *Pollution abatement, Water pollution effects, Nutrients, Phosphorous, Water softening, Legal aspects, Hard water, Public health, Cost comparisons, Aquatic algae, Grants, Model studies.

Phosphorous pollution causes eutrophication, and over half of the phosphorus pollution in the United States is caused by detergents. In these hearings the detergent industry contended that phosphate detergents did not harm and were essential to maintain cleanliness and sanitation standards, since there was no suitable replacement. Rebuttals to these defenses suggest several alternatives to phosphate detergents. The removal of nutrients from waste waters instead of phosphates from detergents as suggested by the industry, would be costly, slow and create additional pollution problems. The committee concluded that no progress had been made in combating eutrophication from detergents and recommended a series of gradual reductions in the use of phosphate detergents, with a complete elimination of their use by the end of 1972. Additionally, the committee recommended: the mandatory labeling of phosphate content during the interim period, expanded research by the Federal Water Quality Administration to develop low-phosphorus or phosphorus-free detergents, and the immediate elimination of the Industry-Government Task Force, whose actual purpose was to secure government cooperation in retaining phosphate detergents. (See also W71-09430) (Gallagher-Florida)
W71-09429

PHOSPHATES IN DETERGENTS AND THE EUTROPHICATION OF AMERICA'S WATERS.
Available from Sup of Doc, US Government Printing Office, Wash DC 20402 Price $1.25. Hearings--Subcomm on Conservation and Natural Resources--House Comm on Gov't Operations, Dec 15 and 16, 1969, 91st Cong, 1st Sess, 1970. 318 p, 2 fig, 47 tab, 2 chart, 110 ref, 3 app.

Descriptors: *Eutrophication, *Phosphates, *Detergents, *Water pollution sources, Phosphorus, Sewage treatment, Municipal wastes, Environmental sanitation, Technical feasibility, Economic feasibility, Administrative agencies, Federal government, Legal aspects, Waste water treatment, Industries, Abatement, Water quality control.

Numerous statements and documents on diverse aspects of phosphate detergents and the effect of phosphates in the eutrophication of America's waters were presented. Representatives of the Soap and Detergent Association presented the detergent industry's position. Testimony was also received from: (1) the Institute of Water and Air Pollution in Stockholm, Sweden; (2) Water Pollution Research and Applications, Inc.; (3) the Commissioner of the Federal Water Pollution Control Administration; (4) Eldib Engineering and Research, Inc.; (5) the Great Lakes Institute; (6) the Assistant Secretary of the Interior for Water Quality and Research; (7) the Center for Urban Studies of the University of Chicago; (8) the Eutrophication Information and Water Resources Centers of the University of Wisconsin; and (9) the Joint Industry-Government Task Force. The testimony dealt with such topics as: (1) the present feasibility of eliminating the use of phosphate detergents, (2) the sources of phosphorous input, (3) information concerning all federal grants or contracts for phosphate removal, (4) problems of removing phosphates from municipal sewage, (5) alternatives to phosphate detergents, and (6) measures taken by the Joint Industry-Government Task Force. (See also W71-09429) (Gallagher-Florida)
W71-09430

1969 FISH KILLS CAUSED BY POLLUTION (STATISTICAL REPORT).
For primary bibliographic entry see Field 05B.

/71-09441

UTRIENT REMOVAL AND ADVANCED
/ASTE TREATMENT.
ittsburg Univ., Pa. Graduate School of Public
ealth.
or primary bibliographic entry see Field 05D.
/71-09450

D. Waste Treatment Processes

ESTING AND EVALUATION OF OIL SPILL
ECOVERY EQUIPMENT.
ain Port Authority, Portland.
or primary bibliographic entry see Field 05G.
71-08942

OTATING BIOLOGICAL CONTACTORS FOL-
OWING ANEROBIC LAGOONS,
wa Beef Processors, Inc., Dakota City, Nebr.
mmie A. Chittenden, and W. James Wells, Jr.
urnal Water Pollution Control Federation, Vol
, No 5, May 1971, p 746-754. 4 fig, 4 tab.

escriptors: *Industrial wastes, *Waste water
eatment, Slime, Biochemical oxygen demand,
ssolved oxygen, Weirs, Oxidation, Hydraulics,
Anaerobic conditions, Aerobic conditions, Aera-
on, Design flow, Temperature, Odor, Iowa, *Ox-
ation lagoons, Biological treatment.
entifiers: Rotating biological contactors, *Meat
cking wastes.

n aerobic biological contactor, in the form of a
tating disc pilot plant, was used to stablize the ef-
ent from an anaerobic lagoon used for treating
at packing wastes. A hydraulic loading of 8.0
d/ft2 of disc area was applied to the three stages
the rotating disc contactor. Under these condi-
ns, no detectable DO was present in the effluent
om any of the stages. BOD reduction in the first
ge was 42.5% and only 50.2% for all three stages
sed on settled BOD values. For the second test
n, the rotational speed of the discs was increased
om 3-6 rpm. DO was still detected only occa-
nally, while first stage BOD reduction averaged
.5% and 65.4% was the average for the overall
stem. For the final test, the flow rate was cut in
lf. There was a DO concentration range of 0.9-
5 mg/l in the effluent from the first stage which
rsisted through the unit. BOD reduction for the
st stage was 79.5% and overall BOD reduction
s 88.2%. From these results, a one stage rotating
c contactor loaded at a rate of 4 gpm/ft2 of con-
ctor area was determined to provide optimum
atment. This system facilitates odor control, and
o provides inexpensive efficient treatment.
owry-Texas)
71-08943

FFECTS OF CONTAMINANTS ON REAERA-
ON RATES IN RIVER WATER,
nois State Water Survey, Peoria.
r primary bibliographic entry see Field 05G.
71-08944

OMBINED SEWER REGULATION WITH
UIDIC REGULATION,
wles Fluidics Corp., Silver Spring, Md.
r primary bibliographic entry see Field 05G.
71-08948

ASTE WATER FROM SIMIAN PRIMATE
CILITIES,
lane Univ., Covington, La. Delta Regional Pri-
te Research Center.
W. Fritschi, and F. W. Macdonald.
urnal Water Pollution Control Federation, Vol
, No 5, May 1971, p 883-889.

scriptors: *Laboratory animals, *Waste water
atment, Design criteria, Sampling, Analytical
hniques, Evaporation, Biological oxygen de-
mand, Urine, Coliforms, Pathogenic bacteria, Animal parasites, Disinfection, Chlorination, Louisiana, *Treatment facilities.
Identifiers: *Primates, *Bacteriological analyses, Feces.

Water and waste water balances were performed on the Delta Regional Primate Research Center in Covington, Louisiana. Total input of both food and water was measured for selected animals and urine, feces, and vomitus of the animals were also collected and analyzed. Average food consumption was 3.0% of body weight, and an estimated 50% of the food is wastes. Measurement of the BOD of the collected waste materials established primate wastes as being 3 to 6 times higher in BOD than conventional municipal wastes. No correlation of total solids with genera, age, weight, or sec of the animals was discovered. Primate feces were found to be cruder than human feces, also and considerable difficulty in finding a suitable feed for the dilution water. Further study of this phenomenon has been planned. Monitoring of daily water usage revealed a fairly constant flow. There was little daily fluctuation in cage washwater, since the animal population was fairly constant, and all cages had to be washed. Bacteriological analysis revealed a wide variety of organisms including several non-specific parasites and numerous pathogens. This discovery neccessitated that particular attention be given to chlorination and disinfection. (Lowry-Texas)
W71-08949

WATER RECLAMATION AND ALGAE HARVESTING,
Asian Inst. of Tech., Bangkok (Thailand).
M. G. McGarry, and C. Tongkasame.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 824-835. 9 fig, 3 tab, 9 ref.

Descriptors: *Ponds, *Water reuse, Reclamation, Algae, Protein, *Oxidation lagoons, Climatic zones, Precipitation, Coagulation, Lime, Hydrogen ion concentration, Temperature, Chlorination, Floatation, Dewatering, Drying, Cost analyses, Waste water treatment.
Identifiers: *Algae harvesting.

Application of high rate oxidation ponds equipped with algae harvesting may help to augment the dwindling water supplies of large metropolitan areas by reclaiming waste water for varied uses, while at the same time producing a usable algal feed supplement. Conditions for optimal operation include: (1) 200 lb BOD/acre/day; (2) 17.7 in. depth; and (3) 1 day detention time. Ponds operated in this manner provide an average effluent BOD (after algae removal) of less than 10 mg/l, and one acre of pond can produce 100,000 lb per yer of algae containing 60% protein. Chemical coagulation and precipitation chemicals studied included lime, alum, and 50 different polyelectrolytes. Polycations were found to be most economic, but usage of polyelectrolytes as aids contributed a greater chemical cost than usage of alum along at pH 6.5. The downflow solids contact system was examined for removal of the algae, either by the split flow, dissolved air, or supersaturated oxygen principles. The algal paste was sun dried on undrained flat plates, to less than 10% moisture. At solar energy levels of 480 g cal/sq cm/day, 2800 lbs/day of dried algae could be processed on one acre. The results of the investigations were incorporated into an urban model which includes recycling of clarified pond effluent for household cleaning purposes. A 67% reduction in raw water needs was predicted for such a system, but much further investigation and refinement is necessary. (Lowry-Texas)
W71-08951

ORGANIC DESORPTION FROM CARBON-I A CRITICAL LOOK AT DESORPTION OF UNKNOWN ORGANIC MATERIALS FROM CARBON,
Missouri Univ., Rolla.
S. C. Allen, R. H. Pahl, and K. G. Mayhan.
Water Research, Vol 5, No 1, Jan 1971, p 3-18. 13 fig, 4 tab, 17 ref.

Descriptors: *Activated carbon, Freeze drying, Vacuum drying, Evaporation, Temperature, Mixing, Separation techniques, Analytical techniques, Chromatography, Spectrophotometry, Filtration, Instrumentation, *Organic compounds, Waste water treatment.
Identifiers: *Desorption, *Standard CCE method, Choroform, Thermocouple.

Before desorption of organic materials from carbon can be accomplished, the carbon must be dried as completely as possible. Laboratory analyses have established that the amount of residual moisture remaining in dried carbon is a function of the method used for drying. In particular, freeze drying leaves less residual moisture than rotary evaporation, which leaves much less residual moisture than air drying. The Standard drying procedures adopted by the American Public Health Association led to wide variations in results, and some modifications are necessary before reproducible results can be obtained from separate investigators. The carbon chloroform extraction method was also subjected to laboratory scrutiny. The specified operating procedure is subject to wide variation in interpretation, to such an extent that reproducibility of results of different investigators is almost nonexistent. The Soxhlet extraction efficiency is affected by the moisture content, and the variability of the moisture content has already been established. Thermal degradation of certain organics may also occur as a result of high pot wall temperatures produced by the heating mantle. Therefore, although the ideas behind the tentative Standard CCE Method are sound, the non-specific nature of the operating conditions may introduce considerable error when considered on an abolute basis. (Lowry-Texas)
W71-08956

THE EFFECT OF CELL RE-CYCLE ON ACTIVATED SLUDGE PROCESS OPERATION,
California Univ., Davis. Dept. of Civil Engineering.
E. D. Schroeder.
Water Research, Vol 5, No 1, January 1971, p 29-39. 9 fig, 7 ref.

Descriptors: *Activated sludge, *Kinetics, Biodegradation, Mixing, Aeration, Organic loading, Analytical techniques, Mathematical models, *Wastewater treatment, Biological treatment, Cytological studies.
Identifiers: Re-cycle cell concentration, Plug flow, Residence time.

Conventionally designed activated sludge processes are currently operating in a range bounded by ideal plug flow and ideal stirred tanks, with completely mixed systems approaching the ideal stirred tanks in operational characteristics. In all cases, trade-offs occur between growth rate (and corresponding bio-oxidation rate), recycle ration, and recycle cell concentration. Recycle cell concentration increases result in increases in reactor cell concentration, for a given recycle ratio, and also a decrease in the residence time necessary to remove a given amount of organic material. The necessity for high recycle cell concentrations establishes the importance of the secondary clarifier to the system. On a general basis, usage of low secondary clarifier overflow rates would probably mean fewer operational difficulties with the activated sludge process. The most important factor directly concerned with recycle, however, is that recycle and cell concentration ratios directly influence the observed growth rate which alters the actual kinetic processes. The effect of recycle must therefore, be included in field data in order for such data to be reliable. (Lowry-Texas)
W71-08957

OCCURRENCE OF FILAMENTOUS MICROORGANISMS IN ACTIVATED SLUDGE,
Wisconsin Univ., Madison. Dept. of Civil Engineering.
G. J. Farquhar, and W. C. Boyle.

Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 779-787. 28 fig, 1 tab, 19 ref.

Descriptors: *Activated sludge, *Microorganisms, Organic loading, Dissolved oxygen, Biochemical oxygen demand, Hydrogen ion concentration, Municipal wastes, Sphaerotilus, Isolation, Aeration, Chlorination, Waste water treatment, Wisconsin.
Identifiers: *Sludge bulking, *Filamentous microorganisms, Lactic acid bacteria, Bacterial physiology.

Samples of activated sludge taken from waste water treatment plants in Southern Wisconsin were analyzed by microbiological techniques, and 17 different types of filamentous micro-organisms were found to be present. The source, date of collection, extent of growth, sludge volume index (SVI), and the mixed liquor suspended solids (MLSS) concentration were recorded for each organisms studied. Thiothrix, Sphaerotilus, lactic acid bacteria, Toxothrix, and Vitreoscilla, having been previously documented as suspected causative agents of sludge bulking, were closely scrutinized. Past difficuluties in determining which organisms were actually present in a sample, due to lack of both facilities and trained personnel, have led to many inconsistencies in previous data. Although exact identification was not possible for individual organisms in most cases, filamentous microorganisms in general have been recognized as contributors to the bulking problem. In most instances, filamentous organisms become entangled with the flock particles creating a bridging effect, so that the floc moves as a mass, and this factor was recognized as leading to poor dewatering characteristics. At present, raw waste water and return sludge chlorination, return sludge reaeration, sludge loading rate reductions, mixed liquor DO adjustments, and preaeration of raw waste water have all been employed to stop sludge bulking. However, since each filamentous organisms responds differently to the control measures, identification is essential to selection of the correct remedial action, eliminating trial and error measures which may make conditions even worst. (Lowry-Texas)
W71-08958

ANAEROBIC STABILIZATION OF POTATO PROCESSING WASTES AS AFFECTED BY ORGANIC LOADING RATE,
Idaho Univ., Moscow. Dept. of Chemical Engineering.
A. T. Wallace, D. W. Siddoway, and M. L. Jackson.
Idaho University Engineering Experiment Station, Research Report No 9, Jan 1970. 28 p, 3 fig, 7 tab, 6 ref.

Descriptors: *Industrial wastes, *Anaerobic digestion, *Organic loading, Hydrogen ion concentration, Chemical oxygen demand, Temperature, Alkalinity, Methane, Carbon dioxide, Nutrients, Sampling, Monitoring, Automatic control, *Waste water treatment, Idaho.
Identifiers: *Potato processing wastes, Volatile acids, Rate constants, Detention times.

Laboratory scale reactors were constructed to determine the treatability of potato processing wastes by anaerobic stabilization. The temperature was fixed at 35 deg C, the residence time of 5 days, and the feed COD levels were 2,000, 4,000, 10,000, and 20,000 mg/l. Efficiency of treatment was determined on the basis of: (1) the reduction in the level of COD between the feed and effluent streams; (2) the methane: carbon dioxide ratio in the effluent gas; and (3) the rate of gas production. From these investigations it was determined that: (1) volumetric efficiency of COD reductions increased linearly with increased volumetric loadings; (2) % COD reduction was nearly constant for a wide range of organic loadings; (3) an anaerobic reactor operated at a 5 day detention time and 35 deg C will stabilize 60% of the COD at loading up to and possibly greater than 20,000 mg/l; (4) increased loadings decrease reactor stability making continuous pH monitoring and control essential for a full-scale reactor; and (5) the biochemical reactions involved had an average pseudo-first order rate constant of .244 days-1, with a range between .150 days-1 and .354 days-1. Further study over a wider range of temperatures, detention times, and organic loadings is necessary to establish characteristics of failures. (Lowry-Texas)
W71-08959

SOME PROBLEMS OF INDUSTRIAL WASTE DISPOSAL FROM A FERTILIZER PLANT,
Electric Reduction Co. of Canada Ltd., Toronto (Ontario).
J. H. Forster.
Proceedings, Ontario Industrial Waste Conference, 16th, June 1969, Niagara Falls, Ontario, p 6-17. 2 fig, 3 tab, 6 ref.

Descriptors: *Phosphates, *Sedimentary rocks, *Fertilizers, *Industrial wastes, Gypsum, Fluorides, Sedimentation, Lagoons, Neutralization, Lime, Slurries, Hydrogen ion concentration, Maintenance, Flow rates, Water reuse, Cost analysis, Evaporation, *Waste water treatment, Waste disposal.

The two major pollutants in effluents from phosphate-containing fertilizer plants are fluorides and gypsum. The fluorides are present as 3 to 4% by weight of the phosphate rocks which are used to produce phosphates. The gypsum is produced in acid splitting of the phosphate from the phosphate rock and is collected as filter cake. Gypsum is formed at a rate of 1.5 to 1.6 tons per ton of rock digested, or 4.6 to 5.2 tons per ton of P sub 2 O sub 5 produced. Total effluent flow averages 3500 IGPM, and contains 27TPD P sub 2 O sub 5, 68. 7TPD fluorides, and 2400 TPD gypsum. This effluent is treated with lime to neutralize the P sub 2 O sub 5 and flurorides, settled to remove the precipitated phosphates and fluorides along with the by-product gypsum, and discharged into the Grand River after clarification. Recurring problems with operation and maintenance led to the construction of a $270,000 addition to recycle the plant water. Significant operation and maintenance savings are being realized, and effluent flow has been reduced from 3000 to 4000 IGPM to approximately 200 IGPM. (Lowry-Texas)
W71-08961

UTILIZATION AND STABILIZATION OF SOLID WASTES,
Bureau of Mines, Salt Lake City, Utah. Salt Lake City, Metallurgy Research Center.
K. C. Dean, R. Havens, and E. G. Valdez.
Proceedings, Ontario Industrial Waste Conference, 16th, June 1969, Niagara Falls, Ontario, p 18-42.

Descriptors: *Solid wastes, *Industrial wastes, Waste dumps, Cost analysis, Economic feasibility, Technical feasibility, Vegetation establishment, Stope stability, Bank stability, Erosion, Fertilization, Nitrogen, Phosphates, Leaching, Metals, Toxicity, Hydrogen ion concentration, Solubility, Slimes, Dewatering, Salinity, Germination, Radiation, Percolation, Osmotic pressure, Utah, Waste disposal, Waste water treatment.
Identifiers: *Salt Lake City, Waste recovery.

Expansion of the population is rapidly eliminating isolated areas. These areas, many of which had formerly been used as dumping grounds for waste products because of their isolation, must now be redecorated and their original natural beauty restored. Utilization and reclamation studies have been initiated to discover: (1) methods of producing copper from dump leach solutions using shredded auto soap as a cementation medium; (2) ways of recovering zinc from foundry dusts; (3) methods of recovering additional values from copper and uranium mill wastes; and (4) procedures for the production of ceramic and construction materials from waste products. Stabilization studies using physical, chemical, vegetative, and combination techniques have also been made in attempts to convert ugly slag piles to more attractive vegetation areas. Tables on costs are presented for the various methods. In the case o stabilization, costs for a combination stabilizatio were reported at $136 per acre. Further extensiv economic and technological feasibility studies ar continuing. (Lowry-Texas)
W71-08962

TREATMENT OF BRASS MILL EFFLUENT AT ANACONDA TORONTO PLANT,
Anaconda American Brass Ltd., Toronto (Ontario).
J. J. McGrath.
Proceedings, Ontario Industrial Waste Conference 16th, June 1969, Niagara Falls, Ontario, p 82-89.

Descriptors: *Industrial wastes, *Acids, Neutraliza tion, Hydrogen ion concentration, Lime, Floccula tion, Coagulation, Water re-use, Oxidation-reduc tion potential, Copper, Iron, Chemical precipita tion, Cost analysis, Pumps, Sludge, Baffles Storage, *Waste water treatment.
Identifiers: *Pickle liquor, Equalization, Toronto Ontario.

A waste water treatment plant, consisting of a col lection sump, an equalization basin, iron contac launders, copper settling pits, a clarifier, thickener tank, and a control building, was con structed at a cost of $750,000 to treat spent acid from a brass mill. Dumping volume of spent aci solutions averages 3500 cu ft annually, while 130 cu ft of dichromate is dumped per week. Coppe recovery is practiced in the iron launders and th copper settling tanks. Approximately 5 tons o scrap iron tube are used per month to form 5 ton of copper cementate from which copper metal i recovered. Sulfur dioxide is available to assist in th reduction in the iron launders, but because of th use of shorter lengths of iron tube, and greater tur bulence, the sulfur dioxide is only a supplementar protection. 22 tons of hydrated lime are used eac month both for pH control and coagulant aid. 5 lb 10 oz. of coagulant aid X 1633 are also used dail to reduce the pinpoint floc escaping in the effluen Treated effluent is re-used as cooling water in th plant. Efforts are continuing in the hope o discovering new and better chemicals for coagula tion and neutralization developing improve recovery techniques, and finding a market for 2 tons per month of filter cake sludge. (Lowry-Tex as)
W71-08963

THE TREATMENT OF LIQUID WASTES FRON AN AUTOMOBILE MANUFACTURING OPERA TION,
General Motors of Canada Ltd., St. Catharine (Ontario).
J. A. Watson.
Proceedings, Ontario Industrial Waste Conference 16th, June 1969, Niagara Falls, Ontario, p 90-98.

Descriptors: *Industrial wastes, *Domestic wastes Cooling water, Storm run-off, Sewers, Analytica techniques, Water pollution control, Neutraliza tion, Sedimentation, Flocculation, Coagulation Hydrogen ion concentration, Lime, Oil, Flotation Incineration, Sampling, Turbulence, *Waste wate treatment.
Identifiers: St. Catharines (Ontario).

The Windsor, Ontario plant of General Motors o Canada Ltd. placed the Windsor Treatment Plan on stream in September 1968, approximately years after the initial survey of the waste discharg problem. Technical expertise in the selection an design of the plant was provided at all levels b G.M. engineers who had already experienced thi type of work, in their own plants or elsewhere. Th installation of a major waste treatment plant at a existing factory is both disruptive and expensiv from the plant standpoint. For this particular case separate sewer lines were built to segregate th three main flows of sanitary wastes, cooling an storm water, and industrial wastes, rather than un dertake a major revision of the existing collectio system. For the prevention of accidental discharge

l floor drains were provided with a single outlet ily at the industrial waste treatment plant. Treatent facilities include flocculation and flotation for l and suspended solids removal, with discharge of idge to an incinerator, and supernatant to the indsor sewerage system. This system will serve as pattern for future waste treatment facilities for M's Canadian plants. (Lowry-Texas)
71-08964

EMOVAL OF PHENOL AND THIOCYANATE ROM COKE PLANT EFFLUENTS AT OFASCO,
ominion Foundries and Steel Ltd., Hamilton (Ontario).
mes E. Ludberg, and G. Donald Nicks.
oceedings, Ontario Industrial Waste Conference, th, June 1969, Niagara Falls, Ontario, p 99-110. ig.

escriptors: *Phenols, *Industrial wastes, odegradation, Activated sludge, Aeration, Oxenation, Nutrients, Phosphates, Nitrogen, Temrature, Hydrogen ion concentration, Neutralizan, Ammonia, Waste dilution, Sedimentation, nalytical techniques, Foaming, Instrumentation, Vaste water treatment.
entifiers: *Cyanide.

ushing liquor from a coking process contains, on e average, 3400 ppm COD 2010 ppm total amonia, 185 ppm thiocyanate and cyanide as CNS, 00 ppm total phenols, and 750 ppm of onohydric phenols, while pH averages 8.8. The ree methods of treating phenolic wastewaters inude: (1) evaporation; (2) solvent extraction; and) bacteriological treatment. Since evaporation of enolic compounds pollutes the air and corrodes e surrounding area, and the solvent extraction ocess both costs more and removes less phenol, e bacteriological process was selected to treat the ,000 gallons of liquor produced daily. The plant cludes a storage tank, a two compartment aeran tank, settling tank, innoculum tank, and a steel mp and electrical control housing. Design pacity is 133,000 IGPD which requires a 1:1 dilun before entering the aeration tanks. Addition of osphate is also essential for good biological owth. Start-up difficulties are included in the scussion along with the measures taken to alviate them. Since start-up, not more than 1 hour r day of maintenance has been required, hough 3 hours/day of laboratory time are quired for analyses, and 6 hours/day of operator ne are required for adjustments. Daily electrical quirements have averaged 1320 KWH, and daily osphate cost is $12.00. (Lowry-Texas)
71-08965

XIDATIVE ASSIMILATION OF NITROGEN-EFICIENT INDUSTRIAL WASTE,
klahoma State Univ., Stillwater.
F. Gaudy, and K. C. Goel.
oceedings, Ontario Industrial Waste Conference, th, June 1969, Niagara Falls, Ontario, p 111-3. 5 fig, 10 ref. USDI Research Grant WP-325.

escriptors: *Industrial wastes, *Nitrogen, utrients, Phosphorus, Chemical oxygen demand, ochemical oxygen demand, Pilot plants, Aeran, Hydrogen ion concentration, Temperature, arbohydrates, Kinetics, Carbon, Sludge, *Waste ater treatment.
entifiers: *Oxidative assimilation, *Endogeneous ration, Glucose, Supernatant.

tch and pilot plant studies utilizing a synthetic rbohydrate waste, a synthetic non-carbohydrate aste, and a nitrogen deficient industrial effluent ere performed to determine the feasibility of eating nitrogen deficient wastes. Present practice cluded nitrogen addition before the aeration nk. The kinetics of the process precluded imediate utilization of the nitrogen, which subquently passed through and into the effluent. owever, by allowing the reaction to proceed under nitrogen deficient conditions, oxidative assimilation removed organic material as stored carbon, which was then reacted with nitrogen during endogenous respiration. Test results showed no leakage of nitrogen to the effluent, and also verified that less nitrogen would be required. The process operated satisfactorily at COD/N ratios of as high as 70 to 1 for the synthetic wastes. This corresponded to more than twice the conventional BOD to N ratios. Further experimentation at plants with this type of waste is needed. Optimum detention times in the feeding and endogenous aerators, optimum recycle solids levels, and the limiting BOD to N ratio have yet to be determined. Although this procedure deviates considerably from standard practice, its benefits are obvious, and it is to be hoped that operating personnel interested in reducing costs and stream enrichment will experiment with it. (Lowry-Texas)
W71-08966

TREATABILITY STUDIES FOR INDUSTRIAL WASTES,
Prosearch Ltd., Oakville (Ontario).
Robert W. Slater, and Frank Guillame.
Proceedings, Ontario Industrial Waste Conference, 16th, June 1969, Niagara Falls, Ontario, p 124-140. 15 fig, 1 ref.

Descriptors: *Treatability studies, *Industrial wastes, *Design criteria, Biochemical oxygen demand, Aeration, Oxygenation, Sludge, Mixing, Organic loading, Microorganisms, Activated sludge, Pilot plants, Analytical techniques, Cost analysis, Flexibility, Lagoons, *Waste water treatment.
Identifiers: *Suspended solids, Oakville (Ontario).

Many references contain design criteria which are geared to the average industrial waste of a paper mill, or a chemical plant, etc. However, not only do these criteria lack validity, but the analytical tests upon which they were based are also invalid. Suspended solids and BOD5 are both outdated parameters which must be replaced by particle size characterization and carbon balances respectively, before any progress can be made in achieving true optimal designs. Three case histories are presented, including graphs of both the values expected by conventional design, and the values obtained by using equipment which simulates the actual components. In addition, the variability of industrial processes necessarily leads to a variability of the wastes produced. Changes in production technology may cause the type of waste discharged to literally change overnight. Treatability studies will safely predict the effect of such changes before they are allowed to upset the plant and jeopardize the receiving waters. In this manner, the cost effectiveness of different unit operations can also be evaluated so that more rational decisions and designs will result in cleaner water at less cost to both the populace and the industry. (Lowry-Texas)
W71-08967

GRASS FILTRATION-POND STABILIZATION OF CANNING WASTE, A TWO-STEP PROCESS,
Canadian Canners Ltd., Hamilton (Ontario).
T. G. Stevens, and G. G. Dunn.
Proceedings, Ontario Industrial Waste Conference, 16th, June 1969, p 161-175. 9 fig, 4 tab.

Descriptors: *Sprinkler irrigation, *Return flow, *Canneries, Industrial wastes, Fruit crops, Strawberries, Peaches, Oxidation lagoons, Screens, *Filtration, Run-off, Evaporation, Percolation, Organic loading, Temperature, Biochemical oxygen demand sub 5, Sampling, Pilot plants, Biodegradation, *Waste water treatment.
Identifiers: St. Davids (Ontario), Canada.

The St. Davids plant of Canadian Canners Ltd. has been in continuous operation since 1896. The processing season begins in mid-June with strawberries, and runs through cherries, apricots, plums and peaches, finishing with pears in late November, with a total processing throughout of 8,000 tons of fresh fruit. Previous treatment consisted of holding the processing waste water in a lagoon over the winter and dumping it into the creek during the Spring thaw when creek flow was maximum. Irrigation was begun in 1958 with a 40 acre field which by 1965 had grown to a 140 acre field which was still too small. A pilot scale study of a series of 5 oxidation ponds was conducted with disappointing results. Finally, it was decided to combine the two systems, with the effluent being irrigated onto the land, and the run-off flowing into a series of stabilization lagoons. An experimental pond measuring 800 ft x 550 ft with a 5 ft depth, was constructed. Since the run-off from the field had BOD sub 5 only 10% of that of the raw waste, the stabilization pond was subjected to light organic loading and functioned well. No cost estimates are available for this system, but it seems to be relatively inexpensive. Work is continuing in an attempt to provide a by-pass directly from the plant to the stabilization pond to prevent large volumes of rainwater from entering the system. (Lowry-Texas)
W71-08968

PRE-TREATMENT OF WASTES AT BARRIE TANNING LIMITED, BARRIE, ONTARIO,
Gore and Storrie Ltd, Toronto (Ontario).
M. Yatabe.
Proceedings, Ontario Industrial Waste Conference, 16th, June 1969, Niagara Falls, Ontario, p 176-187.

Descriptors: *Industrial wastes, *Organic loading, Biochemical oxygen demand, Hydrogen ion concentration, Sludge, Odors, Temperature, Screens, Aeration, Sedimentation, Anaerobic digestion, Dewatering, Maintenance, Cost analysis, *Waste water treatment.
Identifiers: *Tannery wastes, *Pre-treatment, Suspended solids, Barrie (Ontario).

The treatment plant of the city of Barrie experienced problems including: (1) operational problems in treatment due to extremely high and variable BOD loads; (2) high suspended solids loads resulting in sludge handling problems; (3) odor problems; and (4) excessive maintenance of the sewer downstream of the tannery. A comprehensive program of water conservation was employed at the tannery, resulting in a 30% reduction of the waste flow. The daily volume of waste to be handled stabilized at 185,000 gallons. The plant was designed for primary treatment only, including screening flow equalization, pre-aeration, settling, sludge removal and storage, scum removal, flow metering, tank truck removal of scum and sludge, and dewatering. Limits established for the effluent were: (1) 300 ppm BOD; (2) 350 ppm suspended solids; (3) 100 ppm ether solubles; and (4) pH range of 5.5 to 9.5. From the limited data available so far, for BOD and SS the ranges are from 290 to 600 ppm and 300 to 760 ppm respectively in the effluent. Total cost of this installation was $195,000, with financing arranged by the city. Much improvement in the city treatment plant has been noted, with a reduction in sludge haulage from 15 to 5 truck loads per day. Studies are continuing in the areas of chemical coagulation, sludge concentration, and odor removal. (Lowry-Texas)
W71-08969

TREATMENT OF POTATO PROCESSING WASTES AT SALADA FOODS LTD., ALLISTON,
Ontario Water Resources Commission, Toronto.
T. D. Armstrong, and B. I. Boyko.
Proceedings, Ontario Industrial Waste Conference, 16th, June 1969, Niagara Falls, Ontario, p 188-208.

Descriptors: *Potatoes, *Industrial wastes, Screens, Sedimentation, Organic loading, Activated sludge, Aeration, Dissolved oxygen, Sludge, Oxidation lagoons, Algae, Administration, Maintenance, *Waste water treatment.
Identifiers: *Potato processing wastes, Aerobic lagoons, Anaerobic lagoons.

The Salada Plant at Alliston, Ontario, was constructed in 1959. At this time, 5000 lbs/hr of potatoes were processed into potato flakes during a 24 hour day. Since that time new products have been added, and water consumption, initially 200,000 gpd now ranges from 630,000 to 750,000 gpd during the August to May processing season. The Company and the town were to construct secondary treatment facilities jointly. The initial installation was designed for a waste flow of 150,000 gpd and included screening, sedimentation, an anaerobic lagoon, and two aerobic lagoons. The lagoon filled for 5 1/2 months, and effluent on the first day of overflow was 376,000 gallons with corresponding 6010 lbs BOD. The plant was overloaded both hydraulically and organically, the anaerobic lagoon was changed to an aerobic lagoon, two concrete clarifiers were added, each with 2.75 hours detention time, and bubble gun aeration devices were installed. Since the plant was still over-loaded, a comprehensive survey was ordered, and from the results of this study, a 6.2 hour detention time activated sludge basin was built. Total cost of the treatment plant had risen to $350,000. Although problems were still encountered, this treatment facility provided adequate treatment. Had the necessary long range planning been done earlier, a serious pollutional problem may have been avoided. (Lowry-Texas)
W71-08970

GRANTS FOR CONSTRUCTION OF TREATMENT WORKS.
For primary bibliographic entry see Field 06E.
W71-08980

SIMULATION OF AMMONIA STRIPPING FROM WASTE WATER,
Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.
Joseph F. Roesler, Robert Smith and Richard G. Eilers.
Journal of the Sanitary Engineering Division, ASCE, Vol 97, SA 3, Proc Paper 8182, p 269-286, June 1971. 18 p, 10 fig, 1 tab, 19 ref, 2 append.

Descriptors: *Cooling towers, *Sanitary engineering, *Sewage treatment, Computers, Cost analysis, Reclamation, Water temperature, Waste water treatment.
Identifiers: *Ammonia stripping, Henry's law.

A computer program that can be used for the design and simulation of ammonia stripping and film packed cooling towers was described. The ammonia stripping portion of the program was embedded in the cooling tower circulation in order that the variation of Henry's Law constant with water temperature could be taken into account. The logic of the program was arranged for: (1) Design of cooling towers; and (2) for design of ammonia stripping towers with temperature correction. Two tower configurations were included in the program: (1) Countercurrent in which the liquid flows down and the air moves upward; and (2) Crosscurrent in which the liquid flows down and the air moves horizontally at right angles to the flow of the liquid. Regression equations relating the height of a transfer unit and gas and liquid flow rates were developed from pilot and full scale plant data. Detailed capital and operating cost data were taken from the literature. The computed results indicated that for a crossflow tower an optimum gas to liquid ratio is about 1.75, and for counterflow the optimum is at about 4. Relations between the height of the tower percent removal, cost and influent flow were also examined. It was shown that the total treatment cost levels off between 7 mgd and 10 mgd. (Veverka-Cornell)
W71-08998

PYRITE DEPRESSION BY REDUCTION OF SOLUTION OXIDATION POTENTIAL.
Utah Univ., Salt Lake City. Dept. of Mineral Engineering.
Copy available from GPO Sup Doc, $0.70; microfiche from NTIS as PB-200 257, $0.95. Environmental Protection Agency, Water Pollution Control Research Series Report, December 1970. 50 p, 18 fig, 4 tab, 29 ref. EPA Program 12010 DIM 08/70.

Descriptors: *Separation techniques, *Pyrite, *Flotation, *Reduction (Chemical), Water pollution control, Oxidation-reduction potential, Sulfates, Sulfides, Mining, Acid mine water, Mine wastes, Poisons.
Identifiers: *Mineral separation techniques, Cyanide.

A study of pyrite depression by reducing agents with potassium ethylxanthate as collector indicates that pyrite may be depressed effectively in the flotation of both lead and copper sulfide ores without the use of poisonous cyanide salts. More specifically, the use of sodium sulfite as the depressant may result in metallurgical, economical, environmental and safety advantages over the poison, cyanide. For example, in the case of the copper ore, the best results with cyanide as the depressant were a rougher concentrate recovery of 90.2% and a grade of 4.3% Cu. However, when sulfite was used as the depressant for the same recovery a grade of 7.3% Cu was obtained. (Knapp-USGS)
W71-09078

ANIMAL SLAUGHTERING AND PROCESSING.
For primary bibliographic entry see Field 06E.
W71-09209

REGIONALLY CONSOLIDATED INDUSTRIAL WASTE WATER TREATMENT.
For primary bibliographic entry see Field 06E.
W71-09210

BEHAVIOR OF NATURAL RADIOACTIVE ELEMENTS IN STANDING RESERVOIRS,
A. A. Iskra, N. V. Kulikov, and V. G. Bakhurov.
Trans from Atominaya Energiya. Soviet Atomic Energy, Vol 27, No 2, p 134-137 (1969). 2 tab, 12 ref.

Descriptors: *Radioactive wastes, *Mine wastes, *Radioactive waste disposal, Uranium radioisotopes, Radium radioisotopes, Lead radioisotopes, Treatment, Water pollution sources, Aquatic plants, Absorption, Detritus, Sedimentation, Lake soils, Aquaria, Biological treatment, Ecology, Soil-water-plant relationships.
Identifiers: Thorium radioisotopes.

Four types of simulated reservoir system were studied through experiments performed in 10 liter glass flasks: (1) lake water, (2) lake water plus soil, (3) lake water plus soil plus aquatic plants, (4) lake water plus plants. The predominant buildup of uranium occured in plant materials, that of thorium occurred in detritus and soil, and that of radium in plant materials. The greatest specific activity and buildup capability is possessed by detritus; to a lesser extent, by plants; and to an insignificant degree, by soil. These results may find practical application for secondary purification of liquid radioactive wastes in artificial storage ponds in which (as a supplement to the main process of sedimentation) uptake of radionuclides by certain types of aquatic plants is used. (Bopp-NSIC)
W71-09243

BIOCHEMISTRY AND PHYSIOLOGY OF DENITRIFICATION BY MARINE BACTERIA,
Georgia Univ., Athens. Dept. of Microbiology.
W. J. Payne.
Available from the National Technical Information Service as AD-721 113, $3.00 in paper copy, $0.95 in microfiche. ONR Final Project Report, 19 Mar 71. 19 p. ONR Project Nonr 3677 (01).

Descriptors: *Bacteria, *Nitrogen fixing bacteria, *Denitrification, *Marine microorganisms, Anaerobic conditions, Aquatic microbiology, Cytological studies, Metabolism, Pseudomonas.
Identifiers: Marine biology, Respiration, Oxidation reduction reactions, Nitrogen, *Anaerobic processes.

P. perfectomarinus was found to grow anaerobically at the expense of nitrate, nitrite or nitrous oxide but not chlorate or nitric oxide. In several repetitive experiments, anaerobic incubation in culture media containing nitrate revealed that an average of 82% of the cells in aerobically grown populations were converted to the capacity for respiration of nitrate. Although they did not form colonies under these conditions, the bacteria synthesized the denitrifying enzymes within 3 hr in the absence of oxygen or another acceptable inorganic oxidant. This was demonstrated by the ability, after anaerobic incubation, of cells and extracts to reduce nitrite, nitric oxide and nitrous oxide to nitrogen. From crude extracts of cells grown on nitrate, nitrite or nitrous oxide, separate complex fractions were obtained that utilized NADH as the source of electrons for the reduction of (1) nitrite to nitric oxide, (2) nitric oxide to nitrous oxide, and (3) nitrous oxide to nitrogen. Gas chromatographic analyses revealed that each of these fractions reduced only one of the nitrogenous oxides.
W71-09262

THE STUDY OF THE PHYSICAL, CHEMICAL AND BIOLOGICAL NATURE OF WATER QUALITY UNDER UTAH CONDITIONS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05A.
W71-09268

EFFECTS OF CARBONATE AND MAGNESIUM ON CALCIUM PHOSPHATE PRECIPITATION,
Stanford Univ., Calif. Dept. of Civil Engineering.
John F. Ferguson, and Perry L. McCarty.
Environmental Science and Technology, Vol 5, No 6, p 534-540, June 1971. 7 p, 9 fig, 2 tab, 23 ref.

Descriptors: *Phosphates, *Waste water treatment, *Chemical precipitation, *Anaerobic digestion, Nutrients, Water pollution control, Carbonates, Magnesium, Analytical techniques.
Identifiers: *Phosphate removal.

The effect of magnesium and carbonate on calcium phosphate precipitation was investigated at concentration conditions resembling those in the anaerobic digestion process and at concentration ratios typical of waste waters. The systems were allowed to precipitate at constant temperatures (20 to 30 deg C). The precipitation time was usually 24 hr, but varied from 1 min to several weeks. With magnesium present, the phosphate residual decreased gradually; low values were found at pH above 9. Without magnesium, local minimum and maximum in the residual phosphate were found respectively, at pH 8 and 9.5. Calculated activity products and solids analyses supported a hypothesis of the effect of magnesium on the precipitated solids. Higher carbonate concentrations increased the phosphate residual at pH 8 to 11. The effect was reduced in systems with high magnesium concentrations. (Knapp-USGS)
W71-09294

NEW PROCESS DETOXIFIES CYANIDE WASTES,
H. Martin Malin, Jr.
Environmental Science and Technology, Vol 5, No 6, p 496-497, June 1971. 2 p, 1 fig.

Descriptors: *Waste water treatment, *Industrial wastes, *Oxidation, *Chemical precipitation, Poisons, Chemical reactions, Hydrolysis, Neutralization.
Identifiers: *Cyanides, *Plating wastes.

The widespread use of cyanides--particularly sodium cyanide and hydrocyanic acid--and the extreme toxicity of the free cyanide ion, make adequat

etoxification of cyanide-laden effluents a matter f considerable environmental importance. The rocess most frequently used to decompose cyaides is alkaline chlorination, which may be accomlished in two ways. First, sodium hypochlorite ay be added directly to the waste stream. Cyanide then rapidly oxidized to cyanate. Cyanates can be ompletely converted to carbon dioxide and amonia by acid hydrolysis. Lowering the pH of the ffluent to 2 or 3 to destroy cyanates involves yet nother neutralization of the acidic solution before e effluent can be discharged. Another detoxificaon procedure--electrolytic oxidation--is sometmes applicable when cyanide concentrations are ery high. A novel process which should appeal rimarily to small plant operators oxidizes cyanide om plating wastes to cyanates and simultaneously recipitates zinc or cadmium complexes which can e removed by simple filtration. The key to the rocess is a proprietary peroxygen formulation. It ntains 41% hydrogen peroxide with trace mounts of stabilizers and a small amount of a atented catalytic compound in aqueous solution. perating costs can be as much as 25% below those r alkaline chlorination with hypochlorite. (K-pp-USGS)
71-09295

HORE EVALUATION OF A PROPRIETARY 0-20 MAN WASTE TREATMENT SYSTEM ESIGNED FOR SHIPBOARD USE,
oast Guard, Washington, D.C. Applied Technolo- Div.
arl L. Schaller, and Thomas S. Scarano.
vailable from the National Technical Information rvice as AD-718 467, $3.00 in paper copy, $0.95 microfiche. Final report, Feb 1971. 19 p, 3 fig. roject No 714122/100.

escriptors: *Waste water treatment, *Activated rbon, Filtration, Adsorption, Aeration, Anaero- digestion, Biochemical oxygen demand, oliforms, Aerobic treatment, Sewage treatment.
entifiers: Shipboard use, Bio-oxidation, Ulaviolet disinfection, Comminutor, Sanitary astes.

shore test program was conducted to determine e effectiveness of a proprietary 10-20 man treatent system designed for shipboard use. The stem investigated made use of activated carbon r the purpose of filtration/adsorption and bio-oxation of sanitary wastes. Influent and effluent aste properties were determined. Physical modifitions were accomplished to convert the mode of eration from aerobic-anaerobic filtran/digestion to acrobic filtration/digestion. Test sults indicated that the system was incapable of eating raw sanitary wastes, primarily because of ugging of the carbon columns with undigested id material.
71-09344

EGIONAL WASTE WATER, SOLID WASTE SPOSAL, WATER SUPPLY, AND STORM RAINAGE SYSTEMS APPRAISAL.
i-County Regional Planning Commission, Peoria,

vailable from the National Technical Information rvice as PB-196 835, $3.00 in paper copy, $0.95 microfiche. Tri-county Regional Planning Comssion Contract Report, Feb 1970. HUD-Ill-P-3.

escriptors: *Regional analysis, *Water pollution atment, *Planning, *Water distribution, Water pply, Drainage, Population, Storm drains, Waste ter, Sewage treatment, Solid wastes.
entifiers: *Regional planning, *Illinois, Regional anning, Storm sewers, Refuse disposal, *Solid ste disposal, *Peoria County (Ill), *Tazewell unty (Ill), *Woodford County (Ill).

e appraisal of the waste water, solid waste posal, water supply, and storm drainage systems for a three county Region in Central Illinois. Interim guidelines are set forth to guide the Commission in reviewing applications for federal assistance related to any of the four systems. An evaluation of the four systems indicate the present status of waste water and solid waste disposal systems are in need of top priority for planning commission actions. Nearly 80% of the region's 350,000 residents are served by systems which treat the waste water to a population equivalent of only approximately 80,000. Needs and Planning Commission actions are presented for the four systems. A study design is presented for future investigation needed to prepare comprehensive regional plans for these systems.
W71-09356

CONCEPT DEVELOPMENT OF A HEAVY DUTY OIL CONTAINMENT SYSTEM FOR USE ON THE HIGH SEAS.
Atlantic Research Corp., Costa Mesa, Calif. Missile Systems Div.

Available from the National Technical Information Service as AD-719 615. $3.00 in paper copy, $0.95 in microfiche. Concept Development of a Heavy Duty Oil Containment System for use on the High Seas, Volume 1, Final Report, Jan 1971. 247 p, 18 tab, 100 fig, 18 ref. Contract No DOT-CG-00492-A.

Descriptors: *Water pollution control, *Oil wastes, *Oily water, *Cleaning, *Barriers, Ships, Design, Model studies, Test procedures.
Identifiers: *Containment system, Oil booms.

Description and analysis of a model test program and design characteristics of a heavy duty oil containment system are presented. The design is intended for long deployment periods and is capable of air transportation to the area. Large Coast Guard vessels or Navy salvage ships are utilized for deployment. This barrier system guides the oil into a containment area using multi booms for collection and recovery. The barrier is Y shaped formed by 100 foot segments linked together. Each section has two main parts: an inflated cylinder that provides flotation and a water filled submerged skirt for dynamic and static stability. The oil containment phenomena and performance characteristics are discussed. (Ensign-PAI)
W71-09367

SALINE WATER CONVERSION ACT OF 1971 (A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO CONTINUE RESEARCH AND DEVELOPMENT FOR THE TREATMENT OF SALINE AND OTHER CHEMICALLY CONTAMINATED WASTE WATER TO MAINTAIN OR IMPROVE THE QUALITY OF WATER).
For primary bibliographic entry see Field 06E.
W71-09435

A BILL TO REQUIRE THE SECRETARY OF THE ARMY, ACTING THROUGH THE CHIEF OF ENGINEERS, TO ENGAGE IN PUBLIC WORKS FOR THE PREVENTION AND CONTROL OF WATER POLLUTION.
For primary bibliographic entry see Field 06E.
W71-09436

NUTRIENT REMOVAL AND ADVANCED WASTE TREATMENT.
Pittsburg Univ., Pa. Graduate School of Public Health.

Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970. 265 p.

Descriptors: *Eutrophication, *Tertiary treatment, *Water quality control, Ammonia, Nitrogen, Phosphorus, Algae, Feasibility studies, Technical feasibility, Economic feasibility, Pilot plants, Ion exchange, Electrolysis, Chemical precipitation, Nitrification, Denitrification, *Waste water treatment.

The 8th Pittsburg Sanitary Engineering Conference was conducted in February of 1970 to assemble current techniques and methods of nitrogen and/or phosphorus removal. A few of the methods presented are: (1) cation exchange; (2) electrolysis; (3) breakpoint chlorination; (4) ammonia stripping; and (5) many others. Removal efficiencies for ammonia, in particular were reported as high as 93%. Systems were tested and retested using various feed rates, system loadings, pH ranges, temperature, etc. Many of the techniques reported not only removal efficiencies but costs in terms of cents/1000 gallons of throughput. For example, column denitrification of water containing 20 mg/l as NO3-N, and using a 3/1 ratio of methanol to nitrogen, was reported at 2.8 cents/1000 gallons for chemicals. By gathering together all of this information and discussing and reproducing it, it was hoped that future lake, river, and stream eutrophication could be prevented by taking preventive action before the waters are destroyed or irreparably damaged. (See also W71-09451 thru W71-09464) (Lowry-Texas)
W71-09450

PHOSPHORUS REMOVAL BY CHEMICAL ADDITION DURING PRIMARY TREATMENT,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Richard C. Brenner.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 29-36. 17 fig.

Descriptors: *Phosphorus, *Chemical precipitation, *Biological treatment, Iron, Aluminum, Lime, Chemicals, Effluent, Trickling filter, Activated sludge, *Waste water treatment.
Identifiers: Polymers.

The current approaches for removing major fractions of phosphorus from waste water are: maximization of biological removal, straight chemical precipitation, and combined chemical-biological interaction using mineral additions. The chemicals used for phosphorus removal in the primary tank are: iron salts plus base plus or minus polymer, aluminum salts and polymer and lime. In the secondary system, iron salts and aluminum and activated aluminia columns are used. The choice of chemicals depends on many factors such as, influent phosphorus level, effluent discharge standard, plant size, etc. The advantages of phosphorus removal in the primary systems are listed. Experimental results employing iron precipitation in the primary sedimentation basin in primary plants, trickling filters and activated sludge plants are all listed and illustrated in various figures. (See also W71-09450) (Rayyan-Texas)
W71-09451

ADVANCED WASTE TREATMENT AT WASHINGTON, D.C.,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Thomas P. O'Farrell, Dolloff F. Bishop, and Stephen M. Bennett.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 99-129. 5 fig, 7 tab, 4 ref.

Descriptors: *Waste water treatment, *Filtration, *Stabilization, Adsorption, Chlorination, Sludge, Lime, Flow diagram, Precipitation, Weirs, Flocculation, Turbidity, *District of Columbia.

The advanced treatment pilot plant consists of: chemical clarification, filtration, water stabilization, carbon adsorption, chlorination, sludge disposal, and a chemical recovery system. Description of all the above units along with a flow diagram is presented. The complete advanced treatment with two-stage lime precipitation and ferric addition to the second clarifier removed 95%

phosphorus and 95% TOC from a minimum quality DC. secondary effluent. The average residual of phosphorus was 0.4 mg/l, 2.3 mg/l, TOS and .4 units turbidity. The replacement of the ferric flocculant reduced the average total removals to 94% phosphorus and 92% TOC with a turbidity of 1.6 units. In all two-stage operations the slurry pool in the first clarifier was unstable, with subsequent expansions causing periodic overflow of the weirs. These overflows were captured in the second clarifier. The single stage (pH 11.5) removed 96% phosphorus and 86% TOC, while lime alone removed 92% phosphorus and 51% TOC. The efficiency of the filtration system depended on the efficiency of the clarification system. The dual media filter runs averaged 59 hours and the sand filter runs averaged 32 hours. Adsorption removed 75% of TOC in low turbidity. The carbon loading factor averaged 0.133 lb TOC/lb carbon for 12 x 40 mesh carbon. (See also W71-09450) (Rayyan-Texas)
W71-09452

PHOSPHORUS REMOVAL BY ALUM AND IRON CLARIFICATION,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Carl A. Brunner.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 129-130.

Descriptors: *Phosphorus, *Aluminum, *Iron, Hydrogen ion concentration, Economics, Pilot, Flocculation, Activated sludge, *Waste water treatment.
Identifiers: Clarification, Calcination.

Orthophosphate is effectively removed by alum and iron salts. 80% phosphorus removal was achieved using an iron to phosphorus ratio of 1:1, while 80% removal with alum required an alum to phosphorus ratio of 1.2 to 1. The most effective pH is 6 for Al and 4 or less for ferric ion. Polyphosphates are also removed, but less effectively, by iron and aluminum. Conventional upflow or longitudial clarification equipment can be used for phosphorus removal using alum or iron salts. Phosphorus removal with iron or alum is technically possible but not economical. However, this method could be used economically at small plants or as a phosphate polishing process. (See also W71-09450) (Rayyan-Texas)
W71-09453

ALTERNATIVE METHODS FOR PHOSPHORUS REMOVAL,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Carl A. Brunner.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Nutrient Removal and Advanced Waste Treatment, Feb 1970, p 131-134.

Descriptors: *Phosphorus, Nutrients, Tertiary treatment, Nitrogen, *Chemical precipitation, *Absorption, *Anion exchange, Sedimentation, Separation techniques, Ion exchange, Semi-permeable membranes, Resins, Hydrolysis, Solubility, Cost analysis, Technical feasibility, Economic feasibility, *Waste water treatment.
Identifiers: *Regeneration.

The three major phosphorus removal mechanisms discussed are: (1) sorption on activated alumina; (2) precipitation with Lanthanum salts; and (3) anion exchange. Absorption has been more extensively investigated. Phosphorus is the only nutrient removed, and a preliminary cost estimate is 5-6 cents/1000 gallons, based upon regeneration of the alumina, and lime precipitation of the eluted phosphate and other impurities allowing re-use of the NaOH regenerant. Lanthanum precipitates only orthophosphates, and using a La:P ratio of 1:1, residual P concentrations of .01 mg/l can be obtained at pH between 5 and 9.0. Sufficient Lanthanum hydrolysis takes place to prevent any Lanthanum from being lost in the effluent. A recovery method for recovering the expensive Lanthanum must be developed, if such a recovery scheme exists, before the process becomes economically feasible. Anion exchange columns have the capability to remove both phosphorus and nitrogen. Presence of other anions in domestic waste water was shown to have no effect on the rate at which nitrogen and phosphorus ion were exchanged. However, lime precipitation of the regenerant would remove only the phosphates causing a nitrogen buildup, necessitating disposal of some of the brine, and resultant disposal problems. Preliminary cost estimates have set costs for anion exchange at 10 cents/1000 gallons for a 10MGD plant. Pilot scale studies are continuing to provide more accurate information. (See also W71-09450) (Lowry-Texas)
W71-09454

RE-USE AND DISPOSAL OF ALUM AND LIME SLUDGES,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Robert B. Dean.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 135-145. 4 fig, 13 ref.

Descriptors: *Sludge disposal, Water chemistry, Water softening, Hardness (Water), Chemical precipitation, Phosphates, *Lime, Dewatering, Freeze drying, Solubility, Filtration, Pressure, Temperature, Incineration, Digestion, Cost analysis, Technical feasibility, Economic feasibility, *Waste water treatment, *Water reuse.
Identifiers: *Chemical recovery, *Alum, Re-carbonation.

Both lime and alum precipitation reactions produce sludge which must be handled in some manner. First of all, the choice must be made as to whether the sludge is to be disposed of or treated for re-use of the chemicals in it. 250 mg/l of lime produces 500-600 mg/l of sludge with and underflow concentration of 2-3% or 2 tons of sludge solids per mgd. This sludge may be used for soil stabilization, fill for roads, or in agriculture. However, by heating the precipitated calcium carbonate, calcium oxide can be recovered and re-used. The cost of lime recovery is the same as the cost of new lime, but disposal costs are significantly reduced. Costs reported from Dayton, Ohio are $10-$12 per ton, while the Lake Tahoe plant reports lime recovery as costing $20/ton. The results of testing 4 laboratory scale, 75 liter treatment systems are reported and compared with regard to phosphate removal, sluge dewaterability, sludge filterability, and sludge composition. Alum sludges contain 2 Al:1P and probably some Ca plus some organic matter. The sludge will settle to 10% solids, and is amendable to concentration by freezing. The sludge is not biodegradable, and can sometimes cause clogging of the soil when disposed on the land. Lime treated alum sludge can be filter pressed to remove in excess of 50% as soluble aluminate, however, incineration of alum sludge leaves little or no residue for disposal, so for alum, disposal may be less expensive than re-use. (See also W71-09450) (Lowry-Texas)
W71-09455

DISPOSAL AND RE-USE OF LIME SLUDGE,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Dolloff F. Bishop, and Stephen M. Bennett.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 147-179. 14 fig, 4 tab, 8 ref.

Descriptors: *Chemical precipitation, *Turbidity, *Phosphorus, Sludge, Lime, Calcium carbonate, Slaking, Temperature, Hydrogen ion concentration, Pressure, Permeability, Filtration, Vacuum drying, Incineration, Design criteria, District of Columbia, Waste water disposal, Water reuse, *Waste water treatment.
Identifiers: *Thickening, *Recalcination.

Recalcination and re-use of lime allows the buildu of inert materials which generally improve th thickening and dewatering yield of the sludge, bu decrease the Available Lime Index (ALI) and th slaking temperature. Data to indicate whether o not a minimum solids wasting rate for satisfactor slaking occurs is not available. Recovery and re-us has always included some wastage to prevent hig levels of inerts from building up. For lime processe at pH 11.5, solids loading and composition may b estimated from precipitation reactions, waste wate component analyses, and the solids wasting rate At the lower pH range of 9-10, this informatio must be obtained from jar tests. Lime sludg characteristics are dependent upon: (1) calcium carbonate content; (2) amount and type of non carbonate solids removed; and (3) amount of recy cled inert solids. Slight sludge characteristic changes produce wide variability in thickening an dewatering yields. Thickening of modified secon dary lime sludge from the FWPCA-DC pilot plan with a 75% CaCO3 content produced thickene sludge of 20% solids by weight, and filter yields o 15 lbs dry solids/ft2/hr. By contrast, primary lim sludges thickened to only 10% solids and produce filter yields of 2lbs dry solids/ft2/hr. Therefore, on site laboratory thickening tests and filter leaf test on typical sludge are essential to the formulation o a rational design. (See also W71-09450) (Lowry Texas)
W71-09456

BIOLOGICAL NITRIFICATION AN DENITRIFICATION,
Robert A. Taft Water Research Center, Cincinnati Ohio. Advanced Waste Treatment Research Lab.
Edwin F. Barth.
Proceedings, Pittsburg Sanitary Engineering Con ference, 8, Pittsburg, Pennsylvania, Feb 1970, 181-193. 7 fig, 3 tab.

Descriptors: Nutrients, *Nitrogen, *Phosphorus Nitrification, Denitrification, Ammonia, Chlorina tion, Disinfection, Biochemical oxygen demand Nitrogen compounds, Alcohols, Carbon dioxide Efficiencies, Corrosion, Aluminum, Sludge, Public health, Waste water treatment.
Identifiers: *Suspended solids.

Nitrogen in waste waters has been associate mainly with algal blooms. However, the BOD o most secondary effluents is due mainly to am monia, oxidized nitrogen is a serious consideratio in groundwater recharge situations, and both am monia and oxides of nitrogen interfere witl chlorine disinfection of water. Therefore, growin emphasis is being placed on removal mechanism for nitrogen. However, chemical precipitation an biodegradation, two major methods for phosphoru and suspended solids and organic removal respec tively, have been demonstrated to have little or n effect on nitrogen compounds. Therefore pilo plant studies have been initiated at Manassas, Vir ginia, Archbold, Ohio, and at Notre Dame Univer sity, South Bend, Indiana. These pilot plants have consisted of multi-stage treatment for biologica nitrification and denitrification, with some of th studies providing concurrent removal o phosphorus also. The highest % removal efficienc of nitrogen compounds reported here is 61% which was achieved at the Archbold, Ohio installa tion. No cost estimates were tabulated since cos data has so far been relatively insufficient. (Se also W71-09450) (Lowry-Texas)
W71-09457

DENITRIFICATION OF SOLID MEDIA,
Robert A. Taft Water Research Center, Cincinnati Ohio. Advanced Waste Treatment Research Lab.
Richard C. Brenner.
Proceedings, Pittsburg Sanitary Engineering Con ference, 8, Pittsburg, Pennsylvania, Feb 1970, 195-221. 19 fig.

Descriptors: *Denitrification, *Nitrate, *Activate carbon, Adsorption, Efficiencies, Temperature Pressure, Dissolved oxygen, Head loss, Filtration Turbidity, Chemical oxygen demand, Color, Odor Nutrients, *Waste water treatment.

dentifiers: *Methanol, Backwashing, Climatic onditions.

The accidental discovery that 50% nitrification ould be achieved without chemical inducement in arbon columns stimulated investigations in this rea. Since then pilot plants have been constructed t Firebaugh, California, Pomona, California, ebanon, Ohio, and other locations. Both packed ed downflow and upflow columns have been ested. Results indicated that although upflow olumns need very little backwashing, they also ust be operated at surface loading rates of around 4 gpm/ft2 and have a contact time of one to two ours. Downflow columns, on the other hand, must e backwashed regularly, but are able to operate at gpm/ft2 with a 10 minute or less contact time. Methanol was used as a substrate for all investigaons reported, with optimum level of methanol stablished at 3 times the nitrate concentration. 'arying media sizes seemed to have little effect on ne process. Further work is needed to quantify the ffect of varying temperature. Several modificaons of the denitrification process, including open ank denitrification, are included. For column enitrification of a water having influent NO3 of 20 ng/l and using an M/N ratio of 3/1, chemical costs veraged 2.1 cent/1000 gallons. For open tank enitrification of the same influent with M/N—4/1, hemical costs were reported to be 2.8 cent/1000 allons. No cost estimates for equipment were vailable owing to the diversity of processes. (See lso W71-09450) (Lowry-Texas)
V71-09458

THER METHODS OF NITRATE REMOVAL,
obert A. Taft Water Research Center, Cincinnati, hio. Advanced Waste Treatment Research Lab.
. B. Dean.
roceedings, Pittsburg Sanitary Engineering Conerence, 8, Pittsburg, Pennsylvania, Feb 1970, p 23-227. 1 fig, 6 ref.

escriptors: *Denitrification, *Nitrates, Ammonia, itrites, *Ion exchange, Nutrients, Separation echniques, Nitrogen fixing bacteria, Tertiary treatent, Brines, Toxicity, *Waste water treatment, Ions.
dentifiers: Nitrosomonas, Nitrobacter, egenerant, Extended aeration.

The major forms of nitrogen in secondary effluents nclude: (1) ammonia-ammonium ions; (2) nitrite ons; and (3) nitrate ions. Ammonia is produced rom urea and other organic nitrogen in sewage. There is an average of 14 mg/l of ammonia-amonium ion in sewage and the recommended efuent limit is 1 mg/l as N. Nitrite ions are roduced from ammonia and CO2 by nitrosomanas acteria when organic food is low. Nitrite ions verage 0.4 mg/l as N in secondary effluent, and heir recommended limit is 1 mg/l as N. Nitrate ons are produced from nitrite and CO2 by itrobacter, and this readily occurs in streams. itrate ions average 2.7 mg/l in secondary effluent nd their PHS limit is 10 mg/l as N. Ammonia and itrates are rarely both at high levels in one reactor. mmonia is more prevalent in high rate systems, hile nitrates are more commonly associated with xtended aeration systems. Nitrate removal with on exchange is technically feasible, but problems ssociated with disposal of regenerant brines have mited its application. Nitrates may also be emoved by chemical precipitation with ferrous alts, but again the procedure is limited to situaons where ferrous salts are cheap and there is a onvenient dump for the precipitates. Costs for onspecific resins are 18 cent/1000 gallons plus rine disposal, 12 cent/1000 gallons for specific esins, and 4.5 to 8.5 cent/1000 gallons plus the ost of sludge disposal for chemical reduction. All osts are based on influent nitrogen of 20 to 10 ng/l or less for a 10 mgd plant. (See also W71-9450) (Lowry-Texas)
V71-09459

AIR STRIPPING OF AMMONIA,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. B. Dean.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 229-231.

Descriptors: *Ammonia, *Nitrogen, *Solubility, Cooling towers, Carbon dioxide, Lime, Hydrogen ion concentration, Temperature, Cost analysis, *Waste water treatment.
Identifiers: *Air stripping.

Ammonia can be stripped from a solution by bubbling air through it only if the pH is first raised to 11.0 to convert the free ammonium ion to ammonium hydroxide. Ammonia, however, is over 1000 times more soluble in water than is CO2, necessitating a theoretical minimum of 220 ft3 of air for 90% ammonia removal from 1 gallon of water at 20C. Stripping towers become, in essence, water cooling towers, with subsequent cold weather operation difficulties. Also, the solubility of ammonia is increased with decreasing temperature, compounding the problem. Actual performance data from the Lake Tahoe plant indicate that under plant operation conditions, 300 ft3/gallon are actually required. In addition, calcium carbonate scale is formed by reaction with CO2 which must be removed. Reducing the ammonia content of a fluid from 20 mg/l to 2 mg/l would cost 2.3 cents/1000 at pH 11 and 9.9 cents/1000 gallons if the cost of the lime required to raise the pH to 11 is included. These costs are based on a 10 MGD plant, and they do not include scale removal. (See also W71-09450) (Lowry-Texas)
W71-09460

REMOVAL OF AMMONIA BY SELECTIVE ION EXCHANGE,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. B. Dean.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 233-238. 2 fig, 5 ref.

Descriptors: *Ammonia, *Ion exchange, Zeolites, Selectivity, Resins, Nitrogen, Temperature, Hydrogen ion concentration, Lime, Adsorption, Calcium carbonate, Cooling towers, Brines, *Waste water treatment.
Identifiers: *Regenerant, Stripping.

Zeolites have been developed which are selective for ammonia. At a given fraction of NH ..4 in solution, the fraction of NH ..4 on the ion exchange material is much higher for the Hector clinoptilolite than for the conventional ion exchange resin, IR 120. Ammonium ion-specific zeolites are poor adsorbents for Caions, and therefore can be regenerated with limewater. Caions replace ammonium ions on the resin, and the high pH produces un-ionized NH3 from the NH ..4 ions. Sodium ions present in the solution act to speed up the regeneration. Limewater regenerant can be stripped of ammonia in packed columns or cooling towers, since volumes are 5% or less of the total flow, the water can be settled to remove calcium carbonate, replenished with lime, and re-used. There is no waste brine. Cost of ammonia removal by non-selective resins is estimated at 8.1 cent/1000 gallons, with the cost of brine disposal not included. Cost for selective zeolites are reported as between 3 and 6 cent/1000 gallons, with no brines to be disposed of, when treating 15-20 mg/l NH4-N. (See also W71-09450) (Lowry-Texas)
W71-09461

NITROGEN REMOVAL BY BREAKPOINT CHLORINATION,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Dolloff F. Bishop, and Thomas A. Pressley.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania Feb 1970, p 239-247. 3 fig, 1 tab, 6 ref.

Descriptors: *Chlorination, *Ammonia, *Nitrogen, Oxidation, Nitrogen cycle, Hydrogen ion concentration, Hydrolysis, Neutralization, Alkalinity, Acids, Pilot plants, Cost analysis, Storage, Nitrates, *Waste water treatment.
Identifiers: Breakpoint chlorination, Chloramines, Chlorine residual, Caustic.

Ammonia oxidation by 'breakpoint' chlorination provides a physical-chemical means for removing ammonia and completing the natural nitrogen cycle (i.e., oxidation of the ammonia to N2). Chlorine is added to the ammonia water until chlorine residual has reached a minimum and ammonia nitrogen has entirely disappeared. This method has been used for many years in the water industry and has been found to be pH dependent, with efficient breakpointing occurring only at pH 7-8.5. In natural water, non-ammonia chlorine demand may call for a chlorine to ammonia-nitrogen weight ratio of 15 to 1 or greater. Disadvantages of the method include: (1) satisfactory nitrogen removals may not be achieved if greater than 1 mg/l of permanent residual nitrogen compounds occur such as NO3-; (2) large chlorine doses produce more acid by chlorine hydrolysis than can be neutralized by most waste waters, necessitating the addition of caustic to maintain a favorable pH range; (3) high chlorine demands require increased supplies of stored chlorine which represent a potentially hazardous condition; and (4) at chlorine costs of $0.05/lb and a 200 mg/l dose, the cost for the chlorine alone is 8.3 cents/1000 gallons. However, if pilot plant studies establish that acceptable removals can be obtained, on-site chlorine generation from bines, which produces both chlorine and caustic, may overcome the caustic and storage problems in large plants. The operation simplicity alone recommends the method for small plants. (See also W71-09450) (Lowry-Texas)
W71-09462

OTHER METHODS OF AMMONIA REMOVAL,
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Carl A. Brunner.
Proceedings, Pittsburg Sanitary Engineering Conference, 8, Pittsburg, Pennsylvania, Feb 1970, p 249-250.

Descriptors: *Ammonia, *Nitrogen, Feasibility studies, Economic feasibility, Technical feasibility, Ion transport, Resins, Electric currents, Anodes, Cathodes, Stainless steel, Lime, Hydrogen ion concentration, *Waste water treatment.
Identifiers: *Ligands, *Complexes, Ammonia stripping, Regenerant, Platinum.

Three relatively new theoretical methods of ammonia removal are presented with reports on the various stages of developmental progress. Ligand exchange utilizes the fact that ammonia can form a cupro-ammonium complex, with 4 ammonium ions attaching to one copper ion. Attaching the ions to a resin bed would allow the ammonia water to be passed through and the ammonia to become complexed with the copper ions. With exhaustion of all complexing sites, the bed would have to be regenerated, and ammonia might possibly be recoverable from the concentrated regenerant. This method is only in the concept stage, with a laboratory feasibility study to start soon. Electrolytic oxidation of ammonia to elemental nitrogen involves the use of an electrolytic cell, platinum anodes, stainless steel cathodes, and cell voltages in the range of 0.5 volts. Current densities of less than 1 ma/om2 result in large electrode areas which, due to the high cost of platinum, make the method uneconomical. Research is continuing on a method of alloying platinum with other metals to reduce the cost. Finally, laboratory scale investigations of cation exchange membranes have produced as high as 93% removal of ammonia from synthetic waste water containing only sodium and ammonium cations. Alternate compartments in a stack would contain regenerant which would allow cations to replace the ammonia across the mem-

brane. Lime treatment and air stripping would remove gaseous ammonia and allow the regenerant to be re-used. (See also W71-09450) (Lowry-Texas)
W71-09463

AMMONIA STRIPPING AT WASHINGTON D.C.
Robert A. Taft Water Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Thomas P. O'Farrell, and Francis P. Frauson.
Proceedings, Pittsburg Sanitary Engineering Conference, 8th, Pittsburg, Pennsylvania, Feb 1970, p 251-263. 5 fig, 2 tab, 1 ref.

Descriptors: *Cooling towers, *Ammonia, Temperature, Scaling, Calcium carbonate, Chemical precipitation, Lime, Aeration, Biochemical oxygen demand, Flocculation, Nitrification, Alkalinity, Hydrogen ion concentration, Phosphorus, Teratiry treatment, *Waste water treatment, *District of Columbia.
Identifiers: *Ammonia stripping.

An ammonia stripping system, consisting of 5 towers, each packed with 40, 4 ft x 5 ft x 1/2 inch grids, was subjected to a 75 day test. The efficiencies of ammonia removal were determined at various air to liquid (G/L) rates. Liquid loadings were restricted to 1 gpm/ft squared due to the fan capacity. The data was combined to formulate an empirical curve which indicated that 500 ft cubed of air per liquid gallon is required for 90% ammonia removal. Temperatures averaged 78 and 77F for inlet air and water respectively, and pH ranged from 11.8 to 12.0. Accumulation of calcium carbonate in the system forced intermittent shutdown of the system for maintenance. Air to liquid rates decreased from an initial 350 ft cubed air/gallon of liquid to a final 250 ft cubed air/gallon of liquid, thus decreasing the efficiency of the system for ammonia removal, also on account of calcium carbonate buildup in the towers. A 20% system efficiency decrease toward the end was attributed to falling temperatures. Total scale accumulation in the towers was 2 tons, with each grid requiring manual cleaning. Removal of the CaCO3 also upset the chemical clarifier system. From these tests it was determined that scale deposition and reduced temperatures for part of the year preclude ammonia stripping as a feasible nitrogen removal mechanism in Washington, D.C. (See also W71-09450) (Lowry-Texas)
W71-09464

5E. Ultimate Disposal of Wastes

UTILIZATION AND STABILIZATION OF SOLID WASTES,
Bureau of Mines, Salt Lake City, Utah. Salt Lake City, Metallurgy Research Center.
For primary bibliographic entry see Field 05D.
W71-08962

AN ACT RELATING TO SANITARY SEWAGE DISPOSAL UNITS: OCEAN OUTFALL AND DISPOSAL WELL TREATMENT REQUIREMENTS.
For primary bibliographic entry see Field 06E.
W71-08999

ECONOMICS OF COMPOSTING MUNICIPAL REFUSE IN EUROPE AND ISRAEL,
American Public Health Association, New York.
G. J. Kupchik.
Proceedings of the American Society of Civil Engineers Journal of the Sanitary Engineering Division, Proceedings of ASCE, Vol. 92, No. SA6, p. 41-56, December 1966, 4 tab.

Descriptors: *Economics, *Disposal, *Costs, Operations, Survey, Amortization, Evaluation, Interest, Maintenance, Utilities, Income, Fertilizers, Atmospheric pollution, Soils, Refuse, Production.
Identifiers: *Composting municipal refuse, *Pulverization, Salvage, Sale, Land rental, Reserve fund, Processes.

This report came from a survey of various composting systems used in Europe and Israel, under different climatic, economic, and social conditions, by the author in 1965. The most common composting processes are Van Maanen process, Rasping system, Ventilated cell composting, Dano system, and Buhler system. Cost and income data collected from 14 composting plants included amortization, interest, reserve fund, land rental, personnel, utilities, maintenance and repairs, disposal of rejects, miscellaneous costs, salvage, and compost production and sales. Cost analyses was made to determine factors favoring successful operation. Tabulated data were costs of processing raw refuse, costs of processing raw refuse utilizing different composting systems, production and sale of compost, and comparison of costs for pulverizing and composting raw refuse. Applicability of composting refuse to the United States was discussed. Additional research and demonstration projects in refuse disposal methods are urgently needed. (Wang-Rutgers)
W71-09417

A BILL TO REGULATE THE DISCHARGE OF WASTES IN TERRITORIAL AND INTERNATIONAL WATERS UNTIL FIVE YEARS AFTER THE ENACTMENT OF THE ACT AND TO PROHIBIT SUCH DISCHARGE THEREAFTER.
For primary bibliographic entry see Field 06E.
W71-09438

WASTE DISPOSAL IN DEEP WELLS.
National Industrial Pollution Control Council, Washington, D.C.

For sale by the Superintendent of Documents, US Government Printing Office, Washington DC 20402--Price $0.25. National Industrial Pollution Control Council, Sub-Council Report (Feb 1971). 20 p, 1 tab.

Descriptors: *Waste disposal, *Injection wells, *Industrial wastes, *Research and development, Geologic investigations, Legal aspects, Risks, Well regulations, Monitoring, Geological surveys, Standards, Classification, Geographical regions, Ultimate disposal, Waste identification, Damages.

The growing chemical complexity of waste products coupled with the severity of pollution standards has caused industry to view deep well disposal as possibly the only logical method for disposing of certain untreatable wastes. The National Industrial Pollution Control Council recommended immediate research by the federal government and industry to establish: (1) the geological factors involved in deep well disposal, (2) identification of all areas in the country amenable to this form of disposal, (3) a categorization of all wastes and their suitability for deep well disposal, (4) the legal status of deep well disposal, and (5) suitable procedures for monitoring deep wells and disposal areas. Using deep well waste disposal raises several legal questions. When does underground trespass start. To what degree and extent are the users liable for surface or subsurface damage to nearby properties. Who owns water-injected and groundwater recharge. The use of deep well disposal hasn't been sufficiently extensive to establish precedent as to legal responsibilities arising therefrom. Statutory regulations throughout the country are diverse, and ambiguity as to legal responsibilities deters widespread use of this method. (Gallagher-Florida)
W71-09440

5F. Water Treatment and Quality Alteration

AUTOMATIC PLANNING OF THE LEAST-COST WATER DISTRIBUTION NETWORK,
Tahal Consulting Engineers, Ltd., Tel-Aviv (Israel). Long Range Planning Sect.
For primary bibliographic entry see Field 06A.
W71-09223

5G. Water Quality Control

TESTING AND EVALUATION OF OIL SPILL RECOVERY EQUIPMENT.
Main Port Authority, Portland.

Copy available from GPO Sup Doc as SOD No EP 2.10:15080 DOZ 12/70, $1.50; microfiche from NTIS as PB-200 081, $0.95. EPA Report, Dec 1970. 162 p, 27 fig, 25 ref. FWQA Program no 15080 DOZ.

Descriptors: *Oil, *Separation techniques, Oil-water interfaces, Secondary recovery (Oil), Flotation, Evaporation, Currents, Turbulence, Test procedures, Measurements, Water pollution control, Water quality control.
Identifiers: *Oil spill recovery equipment, Curtain booms, Fence booms, Air barriers, Skimmers, Rate of rise.

The Gulf of Mexico, in March 1970, was the scene of a major equipment testing and evaluation study of oil spill control and recovery equipment. The tests took place during 30 knot winds, and 8 ft waves. The oil recovery equipment tested included mechanical barriers, air barriers, and skimming equipment. A detailed report containing both the test results on the capacilities and limitations of the various equipment types tested, and also recommendations on needed improvements was prepared. It was strongly recommended that adequate skimming capacity could be installed and maintained in close proximity to all major industries which would be considered potential oil spill hazards. Recommendations were also prepared concerning the methods of enlisting community aid, both in helping to support the installation of oil spill recovery equipment, and also in working to clean up such spills as do occur. Only through complete co-operation of population and industry can damages from oil spills be minimized, and both the technology and the guidance are now available to safeguard the marine environment and our recreational facilities from irreparable losses. (Lowry-Texas)
W71-08942

EFFECTS OF CONTAMINANTS ON REAERATION RATES IN RIVER WATER,
Illinois State Water Survey, Peoria.
V. Kothandaraman.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 806-817. 3 fig, 8 tab, 15 ref.

Descriptors: *Aeration, *Oxygenation, Rivers, Analytical techniques, Regression analysis, Sampling, Instrumentation, Dissolved oxygen, Saturation, Adsorption, Hydrogen ion concentration, Chemical oxygen demand, Biochemical oxygen demand, *Water quality control, Wastes, Illinois, Waste water treatment.
Identifiers: *Reaeration rate coefficient, Illinois River.

The reaeration rate constant has been shown to depend not only upon the presence or absence of various constituents in the water, but also upon the method used to calculate the constant. River water samples were taken, adjusted to pH 3.0 to suppress biological activity, and subjected to reaeration. Dissolved oxygen probes were used to measure dissolved oxygen concentrations. The Reed Theriault method afforded a unique value for K2 without

equiring knowledge of dissolved oxygen saturation oncentration. However, the gradient method is he best of all the available methods for evaluating he parameters of first-order reactions. The conminants in the river water were discovered to ter the reaeration rate to the extent of plus or inus 15% as compared with distilled water. Howver, no specific relationship between the reaeraon rate co-efficient and constitutent contaminants river water was discovered which was applicable r all mixing conditions. (Lowry-Texas)
71-08944

EVIEW OF THE FEDERAL WATER QUALITY DMINISTRATION ESTUARINE STUDY INDINGS,
nvironmental Protection Agency, Boston, Mass. Vater Quality Office.
ester M. Klashman, and John S. Farlow.
ournal Water Pollution Control Federal, Vol 43, o 5, May 1971, p 739-745.

escriptors: *Estuaries, *Ecosystems, Water esources development, Recreation, Estuarine sheries, Legislation, Water quality control, Adinistration, Water pollution control, Contract adinistration.

he Federal Water Pollution Control Administraon established the Estuarine and Oceanographic rograms branch to carry out a study on pollution f the nation's estuaries. To facilitate this study, 30 ublic meetings were held in the various estuarine ones of the country and its possessions, and 22 ontracts were negotiated to obtain specialized inrmation. In addition, an automated information orage and retrieval system, the national estuarine ventory was developed. Some basic assumptions ade by the national estuarine pollution study inuded the formation of an expanded, long range rogram to encompass the estuarine and coastal ones. Recommendations proposed by the study inuded suggested policies for local, state, and naonal governments, as well as for interested public nd private interest groups. Support of all private terest groups and all regulatory agencies is eeded in any protection plan to help alleviate the ollution already present and also to prevent rther pollution, before the fragile ecosystems of ur nation's estuaries and coastal areas degenerate eyond repair. (Lowry-Texas)
71-08945

RANSPORT OF SHOAL DEPOSITS,
linois Inst. of Tech., Chicago.
. I. Shaheen, and W. Chantarasorn.
ournal Water Pollution Control Federation, Vol 3, No 5, May 1971, p 872-882. 13 fig, 3 tab, 18 ef.

escriptors: *Shoals, *Sediment transport, Sedients, Fluid friction, Suspension, Flow, Viscosity, lasticity, Head loss, Turbulent flow, Laminar flow, ipes, Pumps, Temperature, Water pollution conol.
dentifiers: *Pressure gradients, Friction factor.

umping of dredged solids into lakes has created any problems with respect to the aquatic environents present. An alternative to dumping these redged solids back into bodies of water is land isposal. To avoid dumping in Lake Michigan, ,000 acres will be needed at least. In highly uranized areas, such acreages of land are not readily vailable, and some method of transporting the aterial to the dumping site is necessary Since a ipeline is possibly the most logical solution, the ow behavior of shoal deposits of up to 25.5 wt% as investigated in 0.5 and 1.0 inch pipelines. Pressure drops at various conditions were measured nd used to formulate an empirical relationship for ressure drop as a function of several variables. Acuracy of this relationship was determined to be lus or minus 5%, and it was mainly recommended or suspensions in the turbulent flow region where he shear stress-shear rate relationship for laminar low cannot be applied. A Brookfield viscometer was used to determine flow parameters at solids concentrations of up to 27.1 wt%. Flow curves obtained were checked with experimental curves, and the curves showed Bingham plastic behaviour, with strong plasticity occurring with suspensions of greater than 10 wt% solids. (Lowry-Texas)
W71-08947

COMBINED SEWER REGULATION WITH FLUIDIC REGULATION,
Bowles Fluidics Corp., Silver Spring, Md.
Peter A. Freeman.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 662-871. 12 fig, 3 ref.

Descriptors: *Storm run-off, *Sewers, *Water pollution control, Flow control, Hydraulic structures, Orifices, Pipes, Headloss, Weirs.
Identifiers: *Fluidics, Static diversion strucutres, Combined sewers, Aspiration, Electromechanical, Electrohydraulic.

Combined storm water overflow has become a significant pollutional load on stream, rivers, and lakes in many areas. One of the reasons noted for this was poor flow regulation devices in many areas. Nearly all the equipment which was simple to install and required little or no maintenance also provided less than adequate flow control. Application of the fluidic concept, however, seems to present several distinct advantages: (1) fluidics elements offer the much improved flow regulation formerly possible only with float-operated units or the large electromechanical or electrohydraulic units; (2) fluidics units operate without mechanical moving parts; (3) fluidics elements can be easily adapted to structures in existing plants; and (4) fluidics installations offer the operational reliability and minimum maintenance and surveillance costs of static diversion structures. Fluidics elements, therefore combine the best features of most of the existing equipment types at a modest cost. (Lowry-Texas)
W71-08948

TOWARDS BETTER ADMINISTRATION OF WATER QUALITY CONTROL,
Robert L. Haskins.
Oregon Law Review, Vol 49, No 4, p 373-393, 1970. 21 p, 147 ref.

Descriptors: *Water quality control, *Water pollution control, *Water pollution treatment, *Waste water (Pollution), Water quality, Impaired water quality, Standards, Water resources, Water purification, Rivers, Water treatment, Tertiary treatment, Sewage treatment, River basins, Running waters, Regulation, Legal aspects, Water policy, Water rights, Waste water disposal, Water pollution, Water supply.

Administration of water quality control is the central subject of this note. Primary treatment, secondary treatment, tertiary treatment, and lagooning are discussed as methods of pollution control. The following administrative approaches to water quality control are examined: (1) stream standards, (2) effluent standards, (3) subsidies, and (4) effluent charges. Streams standards are not self executing and do not allocate a river's assimilative capacities except by haphazard enforcement. Effluent standards enforcement is of such a complex nature that states have used uniform standards. This assures some abatement by all but fails to consider abatement cost differences or availability of alternative methods, thus causing greater than optimal cost results. The use of subsidies is a low incentive method of water control. The author feels that the biggest failure of the stream standards, effluent standards, and subsidies approaches has been their failure to deal with external diseconomies. The author concludes that the effluent charges approach provides the missing incentives and the most rational comprehensive method of allocating water quality control responsibility. (Robinson-Florida)
W71-08979

RANSOMING THE MAINE ENVIRONMENT,
G. Graham Waite.
Maine Law Review, Vol 23, No 1, p 103-118, 1971. 16 p, 69 ref.

Descriptors: *Maine, *Pollution abatement, *Riparian rights, *Public rights, Judicial decisions, Water pollution, Water pollution control, Eminent domain, Compensation, Land tenure, Administrative agencies, State jurisdiction, State governments, Local governments, Riparian land, Reasonable use, Competing uses, Municipal water, Navigable waters, Relative rights, Remedies, Waste disposal, Watershed management, Streams, Political aspects, Legal aspects.

A study of court decisions in Maine indicates that the police power has been restricted to a narrow role in state programs for protecting natural resources, and thus has made a clean environment hostage to private property. Two specific decisions pose a serious threat to water pollution control through the police power. These decisions limited the jurisdiction of the Water and Air Environmental Improvement Commission over new pollution to that coming from land within the watershed of the polluted watercourse. The cases have also applied a narrow and unnecessary test of navigability of the watercourse. These decisions rest on the conception that if government suspends the exercise of any individual riparian right, property has been taken and compensation must be paid. Some decisions dealing with property concepts and eminent domain are also examined. Placing the bulk of environmental rehabilitation costs initially on the taxpayer in the form of compensation awards dims the prospects for an effective state program for environmental improvement. (Smiljanich-Florida)
W71-08981

CONSTITUTIONAL DILEMMAS POSED BY STATE POLICIES AGAINST MARINE POLLUTION--THE MAINE EXAMPLE,
Daniel Wilkes.
Maine Law Review, Vol 23, No 1, p 143-174, 1971, 32 p, 110 ref.

Descriptors: *Maine, *Coasts, *Pollution abatement, *Public rights, Water pollution, Water pollution sources, Coastal marshes, Water pollution control, Industrial wastes, Water policy, Water resources development, Water quality control, Estuarine environment, State governments, State jurisdiction, Administrative agencies, Judicial decisions, Adjudication procedure, Interstate, Eminent domain, Compensation, Government finance, Legislation, Social aspects, Legal aspects.

The recently increased interest in ecological preservation has been thwarted in part by the fact that the laws of nuisance and various constitutional guarantees serve to protect the local landowner accused of marine pollution. The various constitutional attacks on coastal anti-pollution legislation are examined to determine possible bases for defending state pollution abatement actions. The unlawful taking attack focuses on the claim that denials of the right to use land to its highest commercial advantage amounts to a taking without compensation. State economics may preclude compensation for all such takings. Various statutes are examined and solutions are offered to resolve this problem for the benefit of the state. The burden of proof dilemma lies in the fact that, although past burdens have been borne by the person attacking a polluter, state courts now must shift those burdens or the state will lose its coastal environment. Various methods of accomplishing this shift are suggested. A further obstacle to the exercise of state power, the interstate commerce dilemma, is also examined with regard to out-of-state polluters. (Smiljanich-Florida)
W71-08982

WATER POLLUTION CONTROL UNDER THE REFUSE ACT OF 1899,
Bill Leaphart.
Montana Law Review, Vol 32, No 1, p 120-129, 1971. 10 p, 61 ref.

Descriptors: *Rivers and Harbors Act, *Pollution abatement, *Waste disposal, *Navigable waters, Water pollution, Water pollution control, Remedies, Legislation, Administrative agencies, Administrative decisions, Navigation, Wastes, Navigable rivers, Flotsam, Waste dumps, Adoption of practices, Regulation, Waste water (Pollution), Environmental effects, Federal government, Legal aspects.
Identifiers: *Refuse Act of 1899.

An extensive study is made of the Federal Refuse Act of 1899 in order to ascertain its present viability as a method of water pollution abatement. Although the Act has seldom been enforced, it can be of considerable strategic value in pollution abatement. The dumping of refuse in navigable waters is prohibited, as is the depositing on the banks of navigable water of refuse which impedes navigation. Penalties for violations are provided, along with a provision encouraging informers, who may split the fine imposed. The definitions of 'refuse' and 'navigability' are examined to indicate the liberal definitions presently attaching to the terms. The policies of the Corps of Engineers and the Justice Department have, however, tended to emasculate the power of the Act. Under present regulations, the agencies will only prosecute where navigation has been impaired and where there has been willful violation. These restrictions are unnecessary for many provisions of the Act. Despite the refusal of these agencies to prosecute violators, a solution is suggested whereby informers may bring a common law cause of action, qui tam, which allows those who will share in a fine to bring an action enforcing the violation. (Smiljanich-Florida)
W71-08983

PREVENTION, CONTROL, AND ABATEMENT OF AIR AND WATER POLLUTION AT FEDERAL FACILITIES,
For primary bibliographic entry see Field 06E.
W71-08984

COLLECTION OF STEAM-ELECTRIC GENERATING PLANT POLLUTION CONTROL DATA.
For primary bibliographic entry see Field 06E.
W71-08985

INDUSTRIAL POLLUTION CONTROL,
For primary bibliographic entry see Field 06E.
W71-08986

LIABILITY FOR OIL POLLUTION CLEANUP AND THE WATER QUALITY IMPROVEMENT ACT OF 1970,
Douglas Meiklejohn.
Cornell Law Review, Vol 55, p 973-991, 1970, 19 p, 138 ref.

Descriptors: *Water pollution, *Oil, *Water pollution control, *Damages, Legislation, Water pollution sources, Ships, Oil industry, Oil fields, Federal government, Pollution abatement, Legal aspects, Insurance, Cleaning, Oily water, Remedies.
Identifiers: *Water Quality Improvement Act of 1970.

The Water Quality Improvement Act, a response to recent oil spills, is a major improvement over existing law, but its provisions should be extended. The Act's predecessors were inadequate, primarily because liability for pollution was limited to instances of gross negligence or willful discharge. Conversely, the Act prohibits oil discharges into United States waters, punishes violation by a civil penalty, requires reporting of violations, and authorizes the President to initiate clean-up. Although previous legislation limited pollution liability to the value of the vessel and its freight, the Act's limits are the lesser of $100 per gross ton of the vessel or $14 million. Unlike the Outer Continental Shelf Lands Act, the Water Quality Improvement Act applies to onshore and offshore facilities and imposes liability for clean-up as well as penalties for violation. Nevertheless, the Act's liability limits are too low, and the liability of the owner may be insufficient to cover clean-up costs of even the Torrey Canyon spill, a small disaster compared to the potential pollution of a supertanker. Although the owner-operator should be liable for pollution as a risk of business, when pollution results from failure to enforce regulations government should be partly liable. Cargo owners' liability for oil pollution should also be considered. (Hart-Florida)
W71-08988

THERMAL ELECTRIC POWER AND WATER POLLUTION: A SITING APPROACH,
Billy D. McDaniel.
Indiana Law Journal, Vol 46, No 1, p 61-112, 1970. 52 p, 190 ref.

Descriptors: *Thermal pollution, *Thermal powerplants, *Ecology, *Legal aspects, Sites, Electric power industry, Hydroelectric plants, Legislation, Water quality, Water Quality Act, Administrative agencies, Federal government, State governments, Water quality control, Water pollution control, Pollution abatement, Fishkill, Water pollution sources, Water pollution effects, Washington.

Temperature is a critical factor in aquatic life; thus industries utilizing water as a coolant have a severe impact upon ecology. Abnormal temperature may kill a species of aquatic life outright, or destroy a link in its food chain, resulting in starvation. Destructive thermal pollution may be minimized by judicious site selection, construction, and operation of a thermal electric power plant. Those contesting siting, construction, or operation may sue on traditional water law grounds or on a nuisance theory. However, the burden of proof is an effective deterrent to relief. More effective relief might be attained through imposition of water quality standards established pursuant to the Federal Water Pollution Control Act and the Water Quality Act. Weaknesses in the Federal Water Pollution Control Act concerning thermal pollution have been remedied somewhat by passage of the 1970 Water Quality Improvement Act, which specifically regulates thermal discharge. Another statutory solution has emerged with passage in the state of Washington of a law regulating site selection for thermal-electric plants by creating a site selection evaluation agency. However, truly effective regulation of thermal discharge should only come with federal administrative reform and creation of a Federal Public Utilities Agency. (Hart-Florida)
W71-08989

WHO'S RESPONSIBLE FOR POLLUTION,
For primary bibliographic entry see Field 06E.
W71-08990

THE PORTER-COLOGNE WATER QUALITY CONTROL ACT.
California State Water Resources Control Board, Sacramento, Calif.

California State Water Resources Control Board, Sacramento, Calif (Nov 1970). 53 p, 1 map.

Descriptors: *California, *Water pollution control, *Water quality control, *Water resources development, Grants, Water policy, Water pollution, Water quality, Water resources, State governments, Legislation, Waste treatment, Waste disposal, Wastes, Financing, Capital supply, Capital, Pollution abatement.

California's Porter-Cologne Water Quality Control Act concerns the following areas: (1) policy of the Act, (2) definitions, (3) state water quality control, (4) regional water quality control, (5) enforcement and implementation, (6) state financial assistance, (7) water reclamation, (8) federal assistance for treatment facilities, (9) sewage treatment plant operator qualifications, (10) water wells and cathodic protection wells, (11) discharges from houseboats on or in the waters of the state, (12) special water quality provisions, and (13) the Clean Water Bond Law of 1970. Published with the Act are water code sections dealing with: (1) the State Water Resources Control Board, (2) water quantity and quality relationships, (3) adjudications to protect the quality of ground water, (4) water reclamation and ground water investigations by the Department of Water Resources, and (5) transportation and disposal of waste. (Robinson-Florida)
W71-08991

CLEAN LAKES ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 06E.
W71-08992

A BILL TO AMEND THE PUBLIC HEALTH SERVICES ACT TO PROHIBIT THE DISCHARGE OF ELEMENTAL MERCURY AND ITS COMPOUNDS INTO ANY WATERS OF THE UNITED STATES WHICH DIRECTLY AFFECT THE PUBLIC HEALTH.
For primary bibliographic entry see Field 06E.
W71-08993

EMERGENCY WATER POLLUTION PREVENTION ACT OF 1971 (A BILL TO ESTABLISH AN IMMEDIATE PROGRAM FOR THE PREVENTION OF OCEAN POLLUTION).
For primary bibliographic entry see Field 06E.
W71-08994

OIL SPILL PREVENTION AND POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-08995

HEINZ V BOROUGH OF ESSEX FELLS (CITY'S LIABILITY FOR DISCHARGING OIL INTO STREAM).
For primary bibliographic entry see Field 06E.
W71-08996

VALUATION OF FLOW AUGMENTATION RELEASES,
Florida Univ., Gainesville. Dept. of Environmental Engineering.
Buford J. Carter, Jr., James P. Heaney, and Edwin E. Pyatt.
Journal of the Sanitary Engineering Division, ASCE, Vol 97, No SA 3, Proc Paper 8203, p 345-359, June 1971. 15 p, 5 fig, 1 tab, 10 ref, 2 append.

Descriptors: *Flow augmentation, *Waste water treatment, *Water pollution sources, *Water quality control, Rivers, Dams, Mathematical programming, Optimization.
Identifiers: Economic analysis, Regional planning.

A mathematical programming technique was used to derive an estimate of the value, measured in terms of waste water treatment costs avoided, of flow augmentation releases in a river with multiple waste sources. The overall methodology developed for quantifying flow augmentation benefits consisted of 2 main components: a simulation model and an optimization model. The purpose of the simulation model was twofold. First, it provided a technique for selecting the critical period (e.g., the one-in-10-yr 7-day low flow). Secondly, given the regional waste water treatment plant configuration specified by the separable convex programming model, it estimated the quantity of additional flow that would be needed in all other time periods of the planning horizon. The effect of additional flow in the activity coefficients in the optimization model was evaluated directly by examining limiting conditions on the quantity of available additional flow. Analyses were performed for a single source of augmented flow in the headwater reaches. The

ffect of the quality of the augmented flow on its conomic value was quantified. Included was a rocedure for incorporating the dependence of the eaeration coefficients and travel time on the river ischarge. (Veverka-Cornell)
/71-09000

ADIOLOGICAL PHYSICS DIVISION. ANUAL REPORT, JULY 1968-JUNE 1969.
rgonne National Lab., Ill.

vailable from the National Technical Information ervice as ANL-7615, $3.00 in paper copy, $0.95 microfiche. Report ANL-7615, 1969. 233 p.

escriptors: *Water pollution effects, *Fallout, Ecosystems, Great Lakes, Trace elements, Radim radioisotopes, Thorium radioisotopes, Uranium dioisotopes, Marine algae, Water pollution ources.
dentifiers: *Cesium radioisotopes.

ncludes 46 articles of which three concern dioisotopes in aquatic ecosystems: Concentraons of trace elements in Great Lakes fish; Conentration of radium, thorium, and uranium by opical algae; and Behavior of fallout cesium-137 aquatic and terrestrial systems. (Bopp-NSIC)
/71-09013

OLUMBIA RIVER STUDIES. ANNUAL ROGRESS REPORT, 1968-1969,
/ashington Univ., Seattle. Lab. of Radiation cology.
. H. Seymour.
vailable from the National Technical Information ervice as RLO-2047-5, $3.00 in paper copy, $0.95 microfiche. Report RLO-2047-5, June 27, 1969. 2 p.

escriptors: *Radioisotopes, *Absorption, Columbia River, Phosphorus radioisotopes, Zinc dioisotopes, Instrumentation, Oysters, Standards, adioactivity effects, Water pollution effects, Tritim, Water pollution sources.
dentifiers: Chromium radioisotopes, Yttrium dioisotopes.

esearch is reported on: distribution of Hanfordroduced phosphorus-32 at North Head; effects of dionuclides on young oysters; Columbia River arine ecological effects; biological half life of zinc oysters; thermal luminescent dosimeters; zinc-65 the biota of the Washington coast; uptake of hromium-51 by a beach diatom; and preparation f new standards, spikes, and samples for gammay spectrometry. (Bopp-NSIC)
/71-09014

AX CREDITS FOR EXPENDITURES ON POLUTION ABATEMENT FACILITIES.
or primary bibliographic entry see Field 06E.
/71-09016

EGULATION OF DRILLING FOR AND ISPOSAL OF SALT WATER.
or primary bibliographic entry see Field 06E.
/71-09031

N ACT TO PROHIBIT THE SURFACE ISCHARGING SALTWATER ON THE SURACE OF LANDS; TO PROHIBIT TAX DEDUCIONS TO THOSE WHO DISCHARGE SALTVATER: AND FOR OTHER PURPOSES.
or primary bibliographic entry see Field 06E.
/71-09040

RANCHISE TAX DEDUCTIONS FOR COST OF NTI-POLLUTION DEVICES, SYSTEMS AND ACILITIES.
or primary bibliographic entry see Field 06E.
/71-09042

STATE SALES TAX EXEMPTION FOR PROCEEDS FROM THE SALE OF ANTI-POLLUTION DEVICES, MATERIALS, SYSTEMS AND FACILITIES.
For primary bibliographic entry see Field 06E.
W71-09064

PYRITE DEPRESSION BY REDUCTION OF SOLUTION OXIDATION POTENTIAL.
Utah Univ., Salt Lake City. Dept. of Mineral Engineering.
For primary bibliographic entry see Field 05D.
W71-09078

LIGHTNER V CITY OF RALEIGH (DAMAGES FROM SEWAGE EMPTIED INTO CREEK ADJACENT TO PRIVATE PROPERTY).
For primary bibliographic entry see Field 06E.
W71-09085

TOWN OF SMITHFIELD V CITY OF RALEIGH (CITY'S DISCHARGE OF RAW SEWAGE INTO ANOTHER CITY'S WATER SOURCE).
For primary bibliographic entry see Field 06E.
W71-09107

A GUIDE TO AQUATIC SMARTWEEDS (POLYGONUM) OF THE UNITED STATES,
Virginia Polytechnic Inst., and State Univ., Blacksburg. Dept. of Biology.
Richard S. Mitchell.
Available from the National Technical Information Service as PB-200 260, $3.00 in paper copy, $0.95 in microfiche. Virginia Polytechnic Institute, Water Resources Research Center Bulletin 41, 1971. 52 p, 10 fig, 1 tab, 65 ref. OWRR Project A-028-VA (3).

Descriptors: *Aquatic plants, *Systematics, *Aquatic weeds, Floating plants, Rooted aquatic plants, Plant morphology.
Identifiers: *Smartweeds, *Polygonum, Polygonum meisnerianum.

The taxonomic key of identifiable aquatic smartweeds, Polygonum sp, is supplemented by a review of the merits and shortcomings of different members of the genus in water management. The second part of the bulletin reports the results of submergence trials conducted in temperature-programmed environmental chambers. The amphibious responses of Polygonum populations were appraised on the basis of mortality of shoots and leaves, and morphology and anatomy of plants. P amphibium, var stipulaceum, and P densiflorum showed the greatest amphibious response. A study of the plagiotrophy or prostrateness of P amphibium varieties indicated that this property is partially genetically controlled and partly a function of the light-inhibited negative geotropism. (Wilde-Wisconsin)
W71-09151

KELLUM V VILLAGE OF GREENUP (UNRECORDED EASEMENT TO DISCHARGE SEWAGE).
For primary bibliographic entry see Field 06E.
W71-09155

UTILIZATION OF HERBIVOROUS FISH IN FISH MANAGEMENT AND MELIORATION OF WATER BASINS, (IN RUSSIAN).

Vestnik Akademii nauk SSSR No 11, p 26-30, 1970.

Descriptors: *Water quality control, *Algae control, *Forage fish, Biocontrol, Remedies, Foods, Fish, Herbivores, Fish management.
Identifiers: USSR.

An address by G B Nikolski is reviewed which was delivered at the meeting of the Presidium of the USSR Academy of Science. At this time, the catch of ocean inhabiting fish is inadequate to meet human population demands and an artificial culture of herbivorous fish can provide an inexpensive source of proteins. In addition to increasing the food supply, such culture will help to eradicate the detrimental growths of algae in irrigation and drainage systems and reservoirs of hydro-electric stations. Herbivorous fish of desirable properties are absent in both Europe and central Asia, but waters of far-eastern Siberia harbor three herbivorous (common and mottled thickheads and white amur), attaining weights over 20 and even 30 kg. The two varieties are not competitors as they derive their sustenance from either near-bottom or surface phytoplankton. The presidium approved a broad program of investigation of herbivorous fish in Asia, Africa, and South America, and a systematic acclimatization of suitable stock in different parts of the USSR. (Wilde-Wisconsin)
W71-09163

LOVE V NASHVILLE AGRICULTURAL AND NORMAL INSTITUTE (MEASURE OF DAMAGES FOR SPRING POLLUTION).
For primary bibliographic entry see Field 06E.
W71-09166

FIRST TRUST CO V PEPPER BROS (RECOVERY OF DAMAGES FOR DESTRUCTION OF ICE CROP BY OIL POLLUTION).
For primary bibliographic entry see Field 06E.
W71-09169

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (REMEDY FOR MUNICIPAL POLLUTION OF PRIVATE PROPERTY).
For primary bibliographic entry see Field 06E.
W71-09170

FRANK TEA AND SPICE CO V L SCHREIBER AND SONS CO (PROPERTY DAMAGES FROM BLOCKAGE OF SEWER BUILT TO REPLACE NATURAL STREAM).
For primary bibliographic entry see Field 06E.
W71-09175

PRIVATE REMEDIES FOR WATER POLLUTION.
For primary bibliographic entry see Field 06E.
W71-09195

FEDERAL AID TO STATES IN FISH AND WILDLIFE RESTORATION.
For primary bibliographic entry see Field 06E.
W71-09197

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-09198

WATER QUALITY ACT OF 1965 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO ESTABLISH THE FEDERAL WATER POLLUTION CONTROL ADMINISTRATION.
For primary bibliographic entry see Field 06E.
W71-09200

STATE CORPORATE INCOME TAX DEDUCTIONS FOR AMOUNTS INVESTED IN ANTI-POLLUTION DEVICES, SYSTEMS AND FACILITIES.
For primary bibliographic entry see Field 06E.
W71-09202

AN ACT PROVIDING FOR TAXATION DEDUCTION OF COST OF POLLUTION ABATEMENT DEVICES.
For primary bibliographic entry see Field 06E.

W71-09203

AN ACT PROVIDING FOR THE EXEMPTION OF STATE USE TAXATION OF POLLUTION ABATEMENT DEVICES OR FACILITIES.
For primary bibliographic entry see Field 06E.
W71-09204

ENVIRONMENTAL IMPROVEMENT AUTHORITIES ACT OF 1969.
For primary bibliographic entry see Field 06E.
W71-09205

CERTIFICATION OF WATER AND WASTE WATER TREATMENT PLANT OPERATIONS ACT.
For primary bibliographic entry see Field 06E.
W71-09207

GUIDELINES FOR AGENCY STATEMENTS ON PROPOSED FEDERAL ACTIONS AFFECTING THE ENVIRONMENT.
Council on Environmental Quality, Wash, D.C.
For primary bibliographic entry see Field 06E.
W71-09208

ANIMAL SLAUGHTERING AND PROCESSING.
For primary bibliographic entry see Field 06E.
W71-09209

REGIONALLY CONSOLIDATED INDUSTRIAL WASTE WATER TREATMENT.
For primary bibliographic entry see Field 06E.
W71-09210

WATER RESOURCES MODELING BY QUASILINEARIZATION AND INVARIANT IMBEDDING,
Kansas State Univ., Manhattan.
Irving Keao Hwang.
M.S. Thesis, Department of Industrial Engineering, 1970. 153 p, 22 fig, 13 tab, 46 ref, 2 append. OWRR Project B-015-KAN (10).

Descriptors: *Water quality control, *Water pollution control, Dynamic programming, Least squares method, Optimization, Systems analysis.
Identifiers: *Quasilinearization, *Invariant imbedding.

Two techniques were used to obtain numerical solutions to water resources problems of the boundary-value type: quasilinearization and invariant imbedding. The quasilinearization technique (Newton-Raphson method), represented an iterative approach combined with linear approximations; while the invariant imbedding approach (invariant principle), reformulated the original boundary-value problem into a family of initial value problems by introducing new variables or parameters. Using quasilinearization it was shown that with very approximate initial guesses for the unknown parameters, only 3 to 7 iterations were needed to obtain a four or five digit accuracy. Its rapid convergence property was a powerful technique for dynamic modeling of stream quality problems. The invariant imbedding approach was useful in obtaining a sequential estimation scheme in which only current data were needed to estimate the current or future values of the parameters. A least squares criterion was used to obtain the optimal and also the state or the future concentrations of the pollutants were estimated by this effective approach. Has 46 references. (Veverka-Cornell)
W71-09217

CITY OF FRANKFORT V SLIPHER (MUNICIPAL SEWAGE DISPOSAL).
For primary bibliographic entry see Field 06E.
W71-09218

DYNAMIC MODELING OF STREAM QUALITY BY INVARIANT IMBEDDING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. Stanley Lee, and Irving K. Hwang.
Kansas Water Resources Research Institute, Contribution No 47. 16 p, 11 fig, 7 ref. OWRR Project B-015-KAN (6).

Descriptors: *Dynamic programming, *Water pollution, Digital computers, Forecasting, Least squares method, Estimating, Mathematical models.
Identifiers: *Invariant imbedding.

With a digital computer, the estimator equations obtained using invariant imbedding were used to estimate the parameters in river or stream pollution. By using these equations, the parameters were estimated directly from differential equations representing the pollution model and from measured noisy data such as BOD and DO. Another advantage of this approach was that a sequential estimation scheme was obtained. By using this sequential scheme, only current data were needed to estimate current or future values of the unknown parameters. A large amount of computer time and computer memory was saved. Not only the parameters but also the concentrations of pollutants were estimated. An effective forecasting technique was formed. The classical least squares criterion was used in the estimation. (Veverka-Cornell)
W71-09220

MITCHELL REALTY CO V CITY OF WEST ALLIS (EXTENT OF DAMAGES CAUSED BY CITY'S POLLUTION OF STREAM).
For primary bibliographic entry see Field 06E.
W71-09231

WAGNER V TOWN OF CONOVER (CITY'S LIABILITY FOR DISCHARGE OF SEWAGE INTO STREAM).
For primary bibliographic entry see Field 06E.
W71-09233

CITY OF BARNESVILLE V PARHAM (CITY'S LIABILITY FOR DISCHARGING SEWAGE INTO OPEN STREAM).
For primary bibliographic entry see Field 06E.
W71-09244

SANITARY DIST OF CHICAGO V CHICAG PACKING CO (DISCHARGE OF STOCKYARD WASTE INTO SEWAGE CHANNEL).
For primary bibliographic entry see Field 06E.
W71-09245

WHERE DOES WATER QUALITY IMPROVEMENT BEGIN,
Agricultural Research Service, Beltsville, Md. Livestock Engineering and Farm Structures Research Branch.
For primary bibliographic entry see Field 05B.
W71-09300

SUMNER V O'DELL (INJUNCTION TO PREVENT POLLUTION OF SPRING WATER BY CATTLE).
For primary bibliographic entry see Field 06E.
W71-09333

WELLS V SHEETS (CITY'S LIABILITY FOR LANDOWNERS POLLUTING DITCH NOT PART OF THE CITY'S DRAINAGE SYSTEM).
For primary bibliographic entry see Field 06E.
W71-09371

BEAVER DAM COAL CO V DANIEL (POLLUTION DAMAGE TO AGRICULTURAL LAND).
For primary bibliographic entry see Field 06E.
W71-09380

CONESTEE MILLS V CITY OF GREENVILLE (CITY'S LIABILITY TO LOWER RIPARIAN OWNER FOR SEWAGE DISCHARGE).
For primary bibliographic entry see Field 06E.
W71-09383

BUCKLES V CITY OF DECATUR (LIABILITY OF CITY FOR POLLUTION OF RIVER).
For primary bibliographic entry see Field 06E.
W71-09386

CHRISTIE V SANITARY DISTRICT OF CHICAGO (LIABILITY FOR EXCESSIVE DISCHARGE OF WATER).
For primary bibliographic entry see Field 06E.
W71-09395

MANAGEMENT OF WATER QUALITY IN RELEASES FROM SOUTHWESTERN IMPOUNDMENTS,
O'Malley and Clay, Consulting Engineers, Houston, Tex.
Herman M. Clay, and E. Gus Fruh.
Water Resources Bulletin, Vol 7, No 1, p 137-147, Feb 1971. 7 figures, 2 tables, 20 references.

Descriptors: *Water quality control, *Impoundments, *Reservoirs, Withdrawal, Municipal water, *Stratification, Industrial water, Colorado River, Texas.
Identifiers: *Bohan - Grace Solution.

The objective here is to see whether selective withdrawal of water is possible in southwestern reservoirs. By use of the Bohan-Grace solution, prediction of outflow water quality was within 15 percent of reservoirs as shallow as 55 feet. Increases in rate of flow increased the withdrawal layer. (Campbell-Rutgers)
W71-09401

NO-TILL CROPPING REDUCES POLLUTION,
Dixon Springs Agriculture Center, Simpson, Ill Dept. of Agronomy.
L. E. Gard.
Compost Science, Vol. 12, No. 2, p. 3-5, March-April 1971.

Descriptors: *Farm management, *Crop production, *Silts, *Water pollution sources.
Identifiers: Grantsburg silt loam.

The author describes the advantages of no-till cropping for grain crops as a possible solution to pollution problems. No-till cropping reduces soil runoff and the harmful pollutants found in the runoff. The author explains that since labor costs, land prices and marketing costs have increasingly brought larger acreages under one man's management, this type of cropping system provides benefits to the farmer in these areas as well. (Holmes-Rutgers)
W71-09408

VICTORS ARE NOT JUDGED,
San Diego State Coll. Calif. Dept. of Geography.
Philip R. Pryde.
Environment, Vol. 12, No. 9, p 30-39, Nov. 1970, 1 table, 2 figures, 14 references.

Descriptors: *Water pollution sources, *Water pollution control, *Economics, *Political aspects.
Identifiers: *U.S.S.R., Northern Donets River, Dnester River.

Water pollution is prevalent in the Soviet Union as in any other populous, industrial country. The author reviews the major pollution problems in the U.S.S.R. and briefly describes what has been done to correct the problems. He discusses the problems that the Soviet Union has encountered with enforcing water pollution regulations and how a system of fines has thus far been ineffective. The author explains that little can be improved without the 'necessary monetary and enforcement measures.' (Holmes-Rutgers)

/71-09416

ANDLING HOT WATER, WITH A PAYOFF,
ew York State Dept. of Environmental Conserva-
on, Albany; and State Univ. of New York, Al-
ny. Atmospheric Sciences Research Center.
P. (John) Mathur, and Ronald Stewart.
he Conservationist, Vol 25, No 3, p 16-20, Dec-
n 1970-71. 13 ref.

escriptors: *Thermal water, *Economic feasibili-
, *Water reuse.
entifiers: Catfish Farmers of America, Wil-
mette Valley in Oregon.

his article describes various uses for hot water
scharged by electric power plants. It is a summary
talks presented at a conference held September
-18, 1970, sponsored by the New York State De-
rtment of Environmental Conservation. Cited in
e article are examples of how agriculture and
ariculture in Britain, Japan and Iceland have used
e heated discharge directly. The article also
scusses industrial and municipal uses of the ther-
al discharge through construction of integrated
upling of the power plant to a closed-cycle
eration. (Holmes-Rutgers)
71-09423

ORE WATER TREATMENT NEEDED,
nvironmental Health Service, Washington, D.C.
C. Johnson.
urnal of Environmental Health, Vol 33, No 4,
n-Feb 1971, p 332-337.

escriptors: *Water supply, *Economies of scale,
blic health, Municipal water, Vermont.
entifiers: Fall River.

he author describes the findings of the Bureau of
ater Hygiene's Community Water Supply Study
hich revealed that 41 percent of the public water
stems surveyed were supplying water of a quality
low the standards set by the U.S. Public Health
rvice. In order to improve this situation the
thor suggests five steps which can be taken:
tter surveillance of water systems, mandatory
lorination, merger of small water systems into
rger ones, assurance of sufficient trained man-
wer for water works operation, and increased
nversion of individual wells into community
ater systems. (Holmes-Rutger)
71-09424

HOSPHATES IN DETERGENTS AND THE
UTROPHICATION OF AMERICA'S WATERS.
r primary bibliographic entry see Field 05C.
71-09429

HOSPHATES IN DETERGENTS AND THE
UTROPHICATION OF AMERICA'S WATERS.
r primary bibliographic entry see Field 05C.
71-09430

ONFERENCE REPORT ON HR 4148, WATER
UALITY IMPROVEMENT ACT OF 1970.
r primary bibliographic entry see Field 06E.
71-09431

NANCIAL RESPONSIBILITY FOR OIL POL-
UTION CLEANUP.
ederal Maritime Commission, Washington, D.C.
r primary bibliographic entry see Field 06E.
71-09432

N ACT IN RELATION TO WATER SUPPLY,
RAINAGE, SEWAGE, POLLUTION, AND
LOOD CONTROL IN CERTAIN COUNTIES.
r primary bibliographic entry see Field 06E.
71-09433

WATER QUALITY STANDARDS (PROCEDURE FOR REVISION).
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-09434

A BILL TO REQUIRE THE SECRETARY OF THE ARMY, ACTING THROUGH THE CHIEF OF ENGINEERS, TO ENGAGE IN PUBLIC WORKS FOR THE PREVENTION AND CONTROL OF WATER POLLUTION.
For primary bibliographic entry see Field 06E.
W71-09436

CLEAN WATER COMMITMENT ACT OF 1971 (A BILL TO PROVIDE A NATIONAL COMMITMENT FOR FINANCING OF EXPANDED PROGRAMS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT, TO ASSURE BETTER COORDINATION IN DEVELOPMENT OF CLEAN WATER PROGRAMS).
For primary bibliographic entry see Field 06E.
W71-09437

A BILL TO REGULATE THE DISCHARGE OF WASTES IN TERRITORIAL AND INTERNATIONAL WATERS UNTIL FIVE YEARS AFTER THE ENACTMENT OF THE ACT AND TO PROHIBIT SUCH DISCHARGE THEREAFTER.
For primary bibliographic entry see Field 06E.
W71-09438

ACID MINE DRAINAGE (INDUSTRY ATTEMPTS TO DESCRIBE AND SOLVE POLLUTION PROBLEMS).

For sale by Superintendent of Documents, US Government Printing Office, Washington DC 20402--Price $0.20. National Industrial Pollution Control Council, Sub-Council Report (Feb 1971). 13 p.

Descriptors: *Coal mine wastes, *Acid mine water, *Water pollution treatment, *Water purification, Mine wastes, Mine drainage, Acidic water, Acid streams, Pyrite, Iron bacteria, Waste water (Pollution), Water pollution sources, Water pollution effects, Pollutants, Chemical reactions, Lagoons, Aeration, Sludge treatment, Reclamation (Waste water), Chemical properties, Acidity, Hardness (Water), Watershed management, Cost-benefit analysis.

Acid mine drainage includes all types of mine drainage associated with coal mining. This source of pollution of streams is now actively being attacked, primarily with simple chemical treatment processes. These leave behind troublesome problems of sludge disposal and hardened water. The principal sources of untreated acid mine drainage are abandoned deep mines and improperly reclaimed surface mines. This study recommends large capital outlays by private and public bodies to control and treat such discharges. These pollutants are formed when air and water combine with the mineral pyrite and unknown bacteria. Solutions are aimed at either preventing formation of or removing these pollutants by chemical treatment prior to release into streams. Mine sealing seeks to exclude air and water from the mine. As yet this has been unsuccessful. Drainage control seeks to minimize contact time between water and pyrite by removing the water through elaborate pumping procedures. Chemical treatment has been most effective. Both acidic and alkaline mine drainage water are aerated in large lagoons, but this creates a problem of sludge disposal and build-up of salts in equipment. Research in this area is directed by the Water Quality Office of the Environmental Protection Agency. (Rees-Florida)
W71-09439

WASTE DISPOSAL IN DEEP WELLS.
National Industrial Pollution Control Council, Washington, D.C.
For primary bibliographic entry see Field 05E.
W71-09440

NUISANCE LAW AS AN ENVIRONMENTAL TOOL,
For primary bibliographic entry see Field 06E.
W71-09442

RIVERS, LAKES, AND STREAMS--REGU LATION.
For primary bibliographic entry see Field 06E.
W71-09443

TAXATION-POLLUTION CONTROL FACILITIES.
For primary bibliographic entry see Field 06E.
W71-09444

AN ACT IN REALTION TO PREVENTION AND ABATEMENT OF AIR, LAND AND WATER POLLUTION.
For primary bibliographic entry see Field 06E.
W71-09445

AN ACT TO CREATE SANITARY DISTRICTS IN CERTAIN LOCALITIES.
For primary bibliographic entry see Field 06E.
W71-09446

GIBSON V CITY OF TAMPA (DISCHARGE OF MUNICIPAL SEWAGE INTO COASTAL WATERS).
For primary bibliographic entry see Field 06E.
W71-09447

REUSS V MOSS-AMERICAN, INC (AUTHORITY FOR CITIZEN TO BRING QUI TAM ACTION FOR VIOLATION OF RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 06E.
W71-09448

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

SIMULATION OF WATER RESOURCE REGIMES,
Maryland Univ., College Park. Dept. of Chemical Engineering.
T. W. Cadman, and F. J. Munno.
Water Resources Research Center, University of Maryland, Apr 1971. 46 p, 9 ref, 4 append. OWRR Project A-001-MD (1).

Descriptors: *Analog computers, *Water resources, *Simulation analysis, Reservoirs, Mathematical models, Water levels, Operations.

The objective of this project was to establish a working knowledge of the principles of analog simulation as they may be applied to water resources systems. Emphasis was directed to the use of the EAI TR-48 analog computer purchased for the project. The principles of operation of the required analog components, the derivation of the mathematical description, the techniques of analog simulation to be employed, and the demonstration of the simulation on the TR-48 were presented by use of four examples, described in detail in the Appendices. The general features of the modern electronic analog computer were discussed in the first example. A simplified water reservoir system was considered in the next example and utilized many of these general features. In a third example, the

difficult step of going from the physical situation to a mathematical model was illustrated first. Then the preliminary simulation procedures of developing a preliminary analog circuit, amplitude scaling the circuit and time scaling were presented. A trial and error problem was formulated. Finally the transient and spatial water level in the soil surrounding a reservoir was examined. The electronic analog computer proved to be a most useful tool in the simulation of water resources systems. (Kriss-Cornell)
W71-08974

ECONOMIC-ECOLOGIC ANALYSIS IN THE CHARLESTOWN METROPOLITAN REGION: AN INPUT OUTPUT STUDY,
Clemson Univ., S.C. Dept. of Agricultural Economics and Rural Sociology.
Eugene A. Laurent, and James C. Hite.
WRRI Report No 19, Water Resources Research Institute, Clemson University, Clemson, South Carolina, Apr 1971. 102 p, 2 fig, 12 tab, 31 ref, 2 append. OWRR Project B-012-SC (3).

Descriptors: *Input-Output analysis, *Model studies, Economic impact, Ecology, Natural resources, Cost analysis, South Carolina.
Identifiers: Charlestown (SC).

A model based on input-output analysis was developed to incorporate environmental as well as pecuniary values into management systems for natural resources. An environmental matrix showing the inflow from the environment and outflow to the environment associated with one dollar of gross sales by various economic activities was developed to fit within the system. The linking of the economic model to the environmental matrix completed the model. The linkage operation involved post-multiplying the environmental matrix by the inverse matrix of the input-output model to form an economic-ecologic matrix. The completed 31-sector economic input-output model was used to quantify economic-ecologic linkages in the Charlestown, South Carolina, study area. Resource or environmental-income multipliers were generated to indicate the direct and indirect impacts, both on the economic and ecologic systems of various types of economic growth as well as alternative management strategies. The model not only provided a planner with information on which sectors were likely to decrease the environmental quality of a region, but also which particular pollutants were likely to be responsible. (Veverka-Cornell)
W71-09002

A NEW TECHNIQUE FOR RELIABILITY CALCULATIONS,
Stagg Systems, Inc., New York.
W. R. Christiaanse.
Institution of Electrical and Electronic Engineers Translations Power Applications Systems, Vol PAS-89, No 8, p 1836-1847, Nov/Dec, 1970. 12 p, 15 fig, 1 tab, 12 ref, 5 disc.

Descriptors: *Reliability, *Mathematical analysis, Computer programs, Mathematical models, Interconnected systems, *Transmission (Electrical), *Analytical techniques, Matrix algebra, Electric power failure, Storms, Maintenance, Probability, Networks, Simulation, Calculations, Overloads, Performance.
Identifiers: Outages, Maintenance schedules.

A new technique for calculating the rate and duration of service interruptions in transmission and distribution systems is presented. The technique can be applied easily to large networks, networks with multiple sources, and networks of any configuration, not necessarily series-parallel subsystems. The approach is based on the traditional exponential probability density functions for time to failure and repair time, but incorporates a new mathematical concept. Results include the expected outage rate and outage duration for each bus, and a summary of the causes of outages at each bus. The derivation of equations and the solution of a sample problem using a pilot computer program are included. In the present form, the technique does not include methods for representing dependent failures of nonparallel lines caused by overloads or tower failures. Provision is made for the effects of maintenance outages. The technique represents a useful planning tool in spite of the limitations. (USBR)
W71-09073

OPTIMIZATION OF DISCRETE OPERATIONS RESEARCH MODELS BY DIFFERENTIAL SENSITIVITY ANALYSIS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
S. Waziruddin, and E. Stanley Lee.
Kansas Water Resources Research Institute, Contribution No 51, (undated). 18 p, 9 ref, 1 tab. OWRR Project B-015-KAN (9).

Descriptors: *Operations research, *Dynamic programming, Optimization, Mathematical models, Model studies, Management.

Multistage operations research problems when formulated for solution by the discrete principle usually resulted in a set of nonlinear differential equations of the boundary value type. Due to the nonlinearity of the system and also due to the complexity of operations research problems, standard methods for solving linear two-point boundary value problems in difference equations could not be applied easily. An algorithm based on differential sensitivity analysis was presented for solving the above problem. The method was essentially based on an algorithm due to Padmanabhan and Bankoff (Chem Eng. Science, Vol 25, p 833, 1970) who proposed a method for overcoming the boundary value difficulty in continuous systems. The method was computationally simple and possessed good stability characteristics with a fast convergence rate. An added advantage was that the method in its present form did not handle easily state variable inequality constraints. Problems from the field of production and advertisement scheduling were solved for purposes of illustration. (Veverka-Cornell)
W71-09215

OPTIMIZATION OF DYNAMIC OPERATIONS RESEARCH MODELS BY A FUNCTIONAL GRADIENT TECHNIQUE,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
S. Waziruddin, and E. Stanley Lee.
Kansas State University Bulletin, Special Report No 93, Kansas Water Resources Research Institute, Contribution No 48, Jan 1971. 20 p, 11 fig, 1 tab, 9 ref. OWRR Project No B-015-KAN (7).

Descriptors: *Dimensional analysis, *Dynamic programming, Optimization, Mathematical models, Modd studies, Management.
Identifiers: *Functional gradient technique, Quasilinearization technique.

A functional gradient technique was used to solve production planning problems with end constraints, inventory control, and advertising scheduleing problems and was shown to be effective for solving multi-dimensional dynamic optimization problems. A seven dimensional production problem was solved as an illustration of the effectiveness of this technique. As seen from the numerical examples, the functional gradient technique was capable of solving fairly large dimensional problems with or without end constraints. Due to the first order convergence properties, this technique is fairly stable even with initial approximations far removed from the true optimum. The main disadvantage of this technique was the slow rate of convergence near the optimum. It is recommended that the functional gradient technique be used to obtain a control trajectory close to the optimum; then switch to methods that have quadratic convergence properties such as quasilinearization or the second variational techniques to obtain the true optimum, thus assuring numerical stability and faster convergence rate. Advantages and disadvantages of the gradient techniques are discussed in detail. (Veverka-Cornell)
W71-09216

WATER RESOURCES MODELING BY QUASILINEARIZATION AND INVARIANT IMBEDDING,
Kansas State Univ., Manhattan.
For primary bibliographic entry see Field 05G.
W71-09217

INVARIANT IMBEDDING, ITERATIVE LINEARIZATION, AND MULTISTAGE COUNTERCURRENT PROCESSES III. ESTIMATION AND THE OVER-DETERMINED SYSTEM,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
J. C. Noh, and E. S. Lee.
Presented at AIChE 67th National Meeting, Atlanta, Georgia, Feb 15-19, 1970. Typescript, undated 34 p, 2 fig, 6 tab, 5 ref. OWRR Project B-015-KAN (8).

Descriptors: *Estimating, *Least squares method, Distillation, Dynamic programming.
Identifiers: *Quasilinearization *Invariant imbedding.

The usefulness of the quasilinearization technique as applied to certain design problems where the reflux ratio is the unknown variable, was demonstrated. The problem was first formulated as a nonlinear two-point boundary value problem in difference equations. This boundary value problem was then solved by the quasilinearization technique. The main advantage of this technique was its quadratic convergence rate. Only 4 or 5 iterations were needed to obtain a 4 to 5 digit accuracy. As shown by numerical examples, convergence was obtained even if very approximate initial approximations or initially guessed values for the unknown functions were used. As an illustration, a simple binary distillation problem was first considered. Multicomponent distillation was then considered. It was shown that the multicomponent distillation problem could be formulated either as a boundary value problem or as an estimation problem depending on the number of terminal concentrations specified. This procedure completely eliminated a trial-and-error difficulty and treated over-determined systems in a straightforward manner by use of least squares criterion and minimization. (Veverka-Cornell)
W71-09219

DYNAMIC MODELING OF STREAM QUALITY BY INVARIANT IMBEDDING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 05G.
W71-09220

DYNAMIC PROGRAMMING QUASILINEARIZATION AND THE DIMENSIONALITY DIFFICULTY,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. Stanley Lee.
Journal of Mathematical Analysis and Applications, Vol 27, No 2, p 303-322, Aug 1969. 20 p, 7 ref. OWRR Project No B-015-KAN (4).

Descriptors: *Dynamic programming, *Dimensional analysis, Computer programs, Mathematical models.
Identifiers: *Quasilinearization technique.

With the linearization of nonlinear equations by the quasilinearization technique, a combined linearization and iteration scheme was obtained. By the use of this scheme, the dimensionality of the functional equation of dynamic programming was reduced to

nc in most cases. The advantage of this technique as that both the computer memory requirement nd computation time were reduced considerably. he usefulness of this method depended heavily pon the rate of convergence of the quasilineariza- on technique, which was shown to be quadrati- lly convergent in various numerical experiments there was any convergence. Furthermor, conver- nce was obtained even with very approximate in- ial approximations for a large number of roblems. The recursive functional equations of ynamic programming only needed to be solved 3 7 times, and the number of iterations required as generally independent of the number of the ate variables. As was seen from the numerical ex- mples, the scheme for overcoming the linearity fficulty did not slow down the convergence rate ppreciably. The main disadvantage of this ap- roach was that the transformation or state varia- e equations must be differential. (Veverka-Cor- ll)
71-09221

ERATIVE TECHNIQUES IN OPTIMIZATION,
ansas State Univ., Manhattan.
Stanley Lee.
ChE Journal, Vol 14, No 6, p 908-916, Nov 68. 9 p, 2 fig, 18 ref. OWRR Project No B-015- AN (3).

escriptors: Dynamic programming, Optimization, athematical models.
entifiers: *Quasilinearization.

e quasilinearization technique, which is essen- lly an iterative approximation scheme combined th linearization, was used to overcome the mensionality difficulties of dynamic pro- amming, especially for discrete systems which re ideally suited for obtaining dynamic pro- amming solutions. The approach was based on e fact that if the difference of differential equa- ns are linear, their closed forms of solutions can obtained. This solution permitted the separation effects due to the initial state from the effects e to the control variables. By using this separa- n combined with quasilinearization, the dimen- nality of the functional equation of dynamic pro- amming was reduced to one in most cases. First, e optimization problem in cross-current extrac- n with discontinuous objection functions was ed to illustrate the technique. Then the technique s generalized to systems of difference and dif- ential equations with fairly general objective nctions. The main disadvantage of the present proach was that the transformation or state vari- le equations must be differential. Furthermore, order to obtain the quadratic convergence pro- rty, the partial derivatives in the Taylor series ex- nsion must be obtained accurately. (Veverka- rnell)
71-09222

TOMATIC PLANNING OF THE LEAST- ST WATER DISTRIBUTION NETWORK,
hal Consulting Engineers, Ltd., Tel-Aviv rael). Long Range Planning Sect.
sha Kally.
ter and Water Engineering, Vol 75, No 902, p 8-152, Apr 1971. 5 p, 5 fig, 2 ref.

scriptors: *Economic efficiency, *Water-dis- ution (Applied), Linear programming, Op- ization, Costs, Planning, Hydraulics.
ntifiers: Hardy Cross method.

th the advent of electronic computers, the nning of water distribution networks was radi- ly changed by being made an automatic com- er operation and by producing the most nomic as well as the most effective solution to planner's problem. To illustrate this planning thod the use of an electronic computer was ded and was based on a combination of 2 hniques: (1) the computation of the hydraulic a of the network by the Hardy Cross method; l (2) finding the optimum solution for a water supply network with the aid of Linear Programming. The results were the following: (1) The special computer program--the 'Network Optimiser'--produced cheaply and rapidly the best cost plan of both looped and tree-like networks; (2) In the case of a tree-like network, the Optimiser selected the optimal (i.e. the least cost) pipe alignment (out of a set of given possibilities) and also determined the optimal combination of diameters; (3) In a looped network, where the routes were fixed, and none of them was to be eliminated, the Optimiser indicated the best selection of pipeline diameters; and (4) When some or all of the network inflows were boosted by a pump, the optimal pumping head was also determined by the Optimiser, so that the whole set of pipeline diameters plus inflow heads was an optimal one. (Veverka-Cornell)
W71-09223

COMPUTERISED OPERATION OF DISTRIBUTION SYSTEMS,
City Water Board, San Antonio, Tex.
Robert P. Van Dyke.
British Water Supply, No 1, p 15-23, Jan 1971. 9 p, 6 fig.

Descriptors: *Distribution systems, Computer programs, Data collections, Control systems, Texas, Water supply.
Identifiers: *San Antonio (Tex).

General applications of supervisory control and computerized operation as well as those of the specific water system used by the City Water Board in San Antonio, Texas were discussed. To expand the water works system to meet the population explosion in San Antonio a computer system was established to enable the City Water Board to have a precise method of data acquisition and control, and to provide the operator of the control center with extremely accurate, dependable, and continuously updated information. The system was capable of expansion to handle a water distribution workload double the size of the one at the present time and additionally provide information and control for 3 more control heating and cooling plants. This system was designed for the most efficient and economical operation of the 2 plants, both for the present and for the years to come. (Veverka-Cornell)
W71-09224

LINEAR PROGRAMING MODELS FOR ESTIMATING THE AGRICULTURAL DEMAND FUNCTION FOR IMPORTED WATER IN THE PECOS RIVER BASIN,
New Mexico Univ., Albuquerque.
Micha Gisser.
Water Resources Research, Vol. 6, No. 4, p. 1025-1032, Aug. 1970, 4 tables, 1 figure, 13 references.

Descriptors: *Water allocation (Policy), *Water demand, *Crop production, *Linear programming.
Identifiers: *Pecos River Basin, Miller's theorem.

This paper provides the results of applying parametric linear programing methods to estimate the agricultural demand function for imported water in the Pecos Basin. A parametric linear programing model suitable for the Pecos Basin is developed. Agricultural activities in which land is irrigated either by local or imported water and either ditch or sprinkler irrigation are developed and adjusted for forecasted 1980 prices. These agricultural activities are used by the parametric linear programing model, and various agricultural demand functions are obtained for the Pecos Basin. These functions show the expected quantities of imported irrigation water that would be demanded at different prices and under a variety of constraints. (Author's abstract)
W71-09421

6B. Evaluation Process

ESTIMATION DEVIATIONS: THEIR EFFECT UPON THE BENEFIT-COST RATIO,
Oklahoma Univ., Norman; and Iowa State Univ., Ames.
R. P. Lutz, and H. A. Cowles.
Engineering Economics, Vol 16, No 1, p 21-42, Oct-Nov 1970. 22 p, 4 fig, 1 tab, 7 ref, append.

Descriptors: *Benefit-cost analysis, *Benefit-cost ratios, Contingency costs, Cost analysis, Estimated benefits, Estimated costs, Construction costs, *Economic feasibility, *Errors, Investment, Analysis, Irrigation systems, Indexes (Ratios), Mathematical models, Frequency distribution, Probability, Decision making.
Identifiers: *Bureau of Reclamation, Density ratio.

Government expenditures have been expanding at a rapid rate in the U S, with no indication that this trend will be curtailed. The very nature of projects developed by these expenditures lends uncertainty to the estimates of costs and benefits that make up the benefit-cost ratio used for project justification. A technique for recognizing uncertainty and bias in estimates of benefits and costs and for compensating for their effects on the benefit-cost ratio is presented. Using the technique to analyze 48 projects of the Bureau of Reclamation, the authors found that for all projects, deviations of the realized benefit-cost ratios from those estimated indicated 44.2% less return to the nation's economy than was anticipated. With variation of this magnitude, the decision-maker should be provided information about the likelihood and extent of deviations from cost and benefit estimates to adequately ration capital among competing demands. (USBR)
W71-09059

WATER RESOURCES DEVELOPMENT BY THE U.S. ARMY CORPS OF ENGINEERS IN PENNSYLVANIA.
Corps of Engineers, Philadelphia, Pa. North Atlantic Div.
For primary bibliographic entry see Field 04A.
W71-09112

WATER RESOURCES DEVELOPMENT BY THE U. S. ARMY CORPS OF ENGINEERS IN THE DISTRICT OF COLUMBIA.
Corps of Engineers, Baltimore, Md. North Atlantic Division.
For primary bibliographic entry see Field 04A.
W71-09113

LAND RECLAMATION AND COMPLEX USE OF WATER RESOURCES (RUSSIAN: MELIORATSIYA ZEMEL' I KOMPLEKSNOYE ISPOL' ZOVANIYE VODNYKH RESURSOV),
For primary bibliographic entry see Field 04A.
W71-09134

FUTURE PROSPECTS OF ALGAE AND MAN,
Vermont Univ., Burlington. Dept. of Botany.
For primary bibliographic entry see Field 05C.
W71-09157

AN ACT FOR A COMPREHENSIVE WATER AND RELATED LAND RESOURCES MANAGEMENT PROGRAM (THE ARKANSAS WATER PLAN).
For primary bibliographic entry see Field 06E.
W71-09201

IDENTIFICATION AND INTERRELATIONSHIPS OF SECONDARY BENEFITS IN WATERWAYS DEVELOPMENT,
Auburn Univ., Ala. Water Resources Research Inst.
Rex K. Rainer, and Charles R. White.

Available from the National Technical Information Service as PB-200 653, $3.00 in paper copy, $0.95 in microfiche. Auburn University Water Resources Research Institute Bulletin 711, Apr 1971. 101 p, 2 fig, 3 tab, 701 ref (76 annotated). OWRR Project A-015-ALA (1).

Descriptors: *Cost-benefit analysis, *Water resources development, *Inland waterways, *Bibliographies, *Abstracts, Reviews, Projects, Economics, Feasibility studies, Planning, Project planning, Management, Systems analysis, Social aspects.
Identifiers: *Secondary benefit analysis.

The evaluation of waterways development projects, and ultimately the selection of a project for action, is usually based upon anticipated benefits that accrue as a result of the development. The identification and assignment of dollar values to secondary benefits is, at best, extremely difficult and vague. The interrelationships among both primary and secondary benefits are not well known. Available data on secondary benefits are scarce as are mathematical models that permit examination of the effect of such benefits on the project selection decision. This report includes a review of current and recently completed research in the area of secondary benefits related to waterways development, evaluation of the results of related and appropriate research, identification of promising areas of research, and an annotated bibliography of appropriate reference sources. The most critical is to develop data systems for watersheds. After an organized data base is available, studies of the relationships of all pertinent factors within a watershed should be made. (Knapp-USGS)
W71-09269

REGIONAL WASTE WATER, SOLID WASTE DISPOSAL, WATER SUPPLY, AND STORM DRAINAGE SYSTEMS APPRAISAL.
Tri-County Regional Planning Commission, Peoria, Ill.
For primary bibliographic entry see Field 05D.
W71-09356

COMPREHENSIVE PLANNING IN THE SOUTHEAST,
Federal Power Commission, Washington, D.C.
G. E. Tomlinson.
Proceedings of the American Society of Civil Engineers Journal of the Hydraulics Division, Vol. 91, No HY5, Sept. 1965, p. 81-105, 4 tab., 2 fig.

Descriptors: *Water resources, *Flood control, *Planning, *Economics, Evaluation, Interest rates, Benefits, Costs, Financing, Multiple-purpose planning, Formulation, Rivers, Decision making, Investment.
Identifiers: *Comprehensive planning, *Commission organization, Framework, Assumptions, Objectives, Policy decision, Criteria, Guideline, Single-purpose planning.

This article dealt with the many problems that arise in connection with the planning, development, control, and use of water and land resources in the Southeast River Basins. Commission organization policy decisions, objectives and guidelines, economic framework, assumptions, and criteria were discussed. In projection formulation, both tangible and intangible effects were considered. Cost and benefits were presented in monetary terms to the extent practicable and, beyond that, the effects were discussed in narrative terms. Projects and programs were specifically formulated to serve all of the conventional purposes plus recreation and pollution abatement. Costs were allocated to all purposes, using standard allocation procedures. The plan was designed to meet projected needs as determined by the use of an economic model. The proposed developments individually and collectively, will produce benefits in excess of costs. The major part of the cost will be borne by nonfederal interests. (Wang-Rutgers)
W71-09418

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ESTIMATION DEVIATIONS: THEIR EFFECT UPON THE BENEFIT-COST RATIO,
Oklahoma Univ., Norman; and Iowa State Univ., Ames.
For primary bibliographic entry see Field 06B.
W71-09059

IDENTIFICATION AND INTERRELATIONSHIPS OF SECONDARY BENEFITS IN WATERWAYS DEVELOPMENT,
Auburn Univ., Ala. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W71-09269

BENEFITS AND BENEFICIARIES: CONTRASTING ECONOMIC AND CULTURAL DISTINCTIONS,
Oregon State Univ., Corvallis. Dept. of Anthropology.
Thomas C. Hogg, and Courtland L. Smith.
Water Resources Research, Vol 7, No 2, p 254-263, Apr 1971. 3 figures, 21 references.

Descriptors: *Water resources development, *Cost-benefit analysis, *Project planning, Multiple purpose projects, Social function.
Identifiers: *Salt River Valley of Arizona, Pacific Northwest, Kalahari desert of Africa, U.S. Forest Service.

The values a society holds regarding effective development of water resources must be considered in the decision making process. Cettain peoples have certain needs and necessities and each relates to a benefit-cost relationship differently. Our value system tells us what is desired. Three test areas, Pacific Northwest, Arizona, and the Kalahari desert in Africa show interesting differences that are significant in the cultural values for water resource differences. (Campbell-Rutgers)
W71-09392

WATER BILLS AND COMPUTERS,
Arizona State Water and Sewer Dept., Phoenix.
Jack W. Blaha.
Journal American Water Works Association, Vol. 62, No. 10, p 603-5, October 1970. 2 tables, 1 figure.

Descriptors: *Computer programs, *Data processing, *Water rates.
Identifiers: *Phoenix, *Billing system.

In the light of the rapid changes in technology and the growth rate acceleration, the author points up the need for a computerized billing system for water, with emphasis on efficiency. (Campbell-Rutgers)
W71-09405

ECONOMICS OF COMPOSTING MUNICIPAL REFUSE IN EUROPE AND ISRAEL,
American Public Health Association, New York.
For primary bibliographic entry see Field 05E.
W71-09417

6D. Water Demand

HYDROLOGIC AND QUALITY CHARACTERISTICS OF THE LOWER MISSISSIPPI RIVER,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02E.
W71-09103

MODELING REGIONAL ECONOMIC AND ENVIRONMENTAL INTERRELATIONSHIPS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
D. C. Sweet.
Tranactions of the American Nuclear Society, Vol 13, No 1, p 30 (July 1970). 1 fig, 2 ref.

Descriptors: *Water resources, *Water management (Applied), *Environmental engineering *Simulation analysis, Water resources development, Computer models, River basins.

A model of the Susquehanna River basin relates the region's economy to its water resources. It is comprised of three interrelated sectors: (1) demographic, (2)employment, and (3) water. The river basin is divided into nine subregions for purposes o economic analysis and the water sector examines certain critical points within each subregion. Each sector of the model is developed for a subregion that interacts with the others. The use of the model is for projecting future economic growth and the impact on water resource development. (Bopp NSIC)
W71-09248

PRELIMINARY EVALUATION OF THE HYDROLOGIC EFFECTS OF IMPLEMENTING WATER AND SEWERAGE PLANS, DADE COUNTY, FLORIDA,
Geological Survey, Miami, Fla.
F. W. Meyer.
Geological Survey Open-file Report 71003, 1971 110 p, 19 fig, 17 tab, 51 ref.

Descriptors: *Water supply, *Urbanization *Sewage disposal, *Florida, *Water resource development, Municipal water, Water balance Planning, Aquifers, Water utilization, Hydrogeology, Land use, Consumptive use, Water demand.
Identifiers: *Dade County (Fla), *Miami (Fla).

As urbanization continues in Dade County Florida, water requirements will increase. I present trends continue, by the year 2020 the tota demand for water supplies in Dade County wi average 760 mgd. About 12 mgd will be pumped t the Florida Keys. By year 2020, 540 mgd of wast water will be discharged from sewers to the ocean With increasing runoff and sewage discharged t the ocean, the total consumptive use of water wi ultimately exceed the region's developed wate supply capability. By 1976, available fresh wate may be insufficient to satisfy all competing de mands, according to recent projections by the U. S Corps of Engineers (1968), unless plans for in creasing the efficiency of water use are effected Plans include reduction in storm runoff by large scale backpumping to Lake Okeechobee and th conservation areas. Other alternatives includ separation of storm and sanitary drainage system and the prevention of fresh water leakage into th sanitary sewer system. (Knapp-USGS)
W71-09334

6E. Water Law and Institutions

TOWARDS BETTER ADMINISTRATION O WATER QUALITY CONTROL,
For primary bibliographic entry see Field 05G.
W71-08979

GRANTS FOR CONSTRUCTION OF TREAT MENT WORKS.

Federal Register, Vol 35, No 62, p 5346-5347, M 1970. 2 p.

Descriptors: *Administrative agencies, *Regul tions, *Sewage, *Water pollution control, Poll tants, Pollution abatement, Water pollution trea ment, Sewage treatment, Administration, Admini trative decisions, Water pollution, Federal gover ment, Government finance, Grants, Treatment.

iew rules proposed by the Interior Department ertaining to grants for construction of treatment vorks are intended to provide greater assurance hat the quality of treated water will be improved. The following requirements are proposed to chieve that objective: (1) treatment works must e included in a basin-wide, metropolitan, or re-ional pollution abatement plan; (2) operation nust conform to requirements for industrial waste reatment; and (3) efficiency, economy, and effec-veness will be achieved by design and periodic in-pection. Information which may be required by ne Commissioner includes: (1) sources of pollu-on; (2) volume of discharge; (3) character of ef-uent; (4) present treatment; (5) water quality ef-ect; and (6) detailed abatement program. No grant ill be made under the new rules if the project is in-nded to treat industrial waste, rather than the astes of the entire community or region con-erned. Where industrial wastes are treated by the roject, an equitable system of cost recovery must e effected. All projects must be inspected an-ually during the first three years and periodically ereafter. (Hart-Florida)
71-08980

ANSOMING THE MAINE ENVIRONMENT,
or primary bibliographic entry see Field 05G.
71-08981

ONSTITUTIONAL DILEMMAS POSED BY TATE POLICIES AGAINST MARINE POLLU-ION--THE MAINE EXAMPLE,
or primary bibliographic entry see Field 05G.
71-08982

ATER POLLUTION CONTROL UNDER THE EFUSE ACT OF 1899,
or primary bibliographic entry see Field 05G.
71-08983

REVENTION, CONTROL, AND ABATEMENT F AIR AND WATER POLLUTION AT EDERAL FACILITIES,
chard M. Nixon.
xec Order No 11507, Federal Register, Vol 35, o 25, p 2573-2576 (Feb 1970). 4 p.

escriptors: *Water pollution control, *Air pollu-on, *Pollution abatement, *Federal government, dministrative agencies, Administrative decisions, dministration, Federal project policy, Water sources, Regulation.
entifiers: *Clean Air Act, *Federal Water Pollu-on Control Act.

order that the federal government may provide adership in the design, operation, and main-nance of its facilities in the nationwide effort to otect and enhance the quality of air and water sources, the President's executive order directs mpliance with air and water quality standards at deral facilities. Heads of federal administrative encies are directed to publish procedures to en-re that their facilities comply with the order, and maintain surveillance to ensure that the stan-rds are met on a continuing basis. The Council Environmental Quality must review and report plementation of the order to the President. enerally, the standards prescribed are those opted pursuant to the Clean Air Act and the deral Water Pollution Control Act. Certain cilities may be exempted from the requirements the national interest. The implementation date is ecember 31, 1972. The order also establishes ndards for new federal facilities and procedures federal water resources projects. (Hart-Florida)
71-08984

OLLECTION OF STEAM-ELECTRIC ENERATING PLANT POLLUTION CONTROL ATA.

deral Register, Vol 35, No 29, p 2832-2833 (Feb 70). 2 p.

Descriptors: *Water pollution control, *Air pollution, *Pollution abatement, *Federal government, Thermal pollution, Federal Power Act, Electric power, Administrative agencies, Water pollution.

The Federal Power Commission publishes notice of proposed rule making. The proposal would require submission of information designed to provide a basis for the development of effective environmental quality programs in coordination with the National Air Pollution Control Administration and the Federal Water Pollution Control Administration. The information form proposed is designed to obtain information as to the fuel quality used in fossil-fueled steam electric generating plants of 25 or more megawatts and other data relating to atmospheric emissions and thermal pollution. Although the form was originally formulated for distribution only to selected utilities, it is now contemplated for reports from all steam-electric plants. The new form reflects the increased federal concern for preservation of air and water resources. The report is to be submitted every fifth year. Comments by interested persons must be forwarded to the Federal Power Commission by March 2, 1970. (Hart-Florida)
W71-08985

INDUSTRIAL POLLUTION CONTROL,
Fred A. Clarenback.
112 Cong Rec 11719-11721 (1966). 3 p.

Descriptors: *Water pollution control, *Pollution abatement, *Industries, *Administration, Water pollution, Water pollution treatment, Industrial wastes, Effluents, Cities, Administrative agencies, Water pollution sources, Non-structural alternatives, Pollutants, Water quality control.
Identifiers: *Effluent charges.

In 1966, a senator advocating a system of economic incentives to encourage industries to abate pollution placed a paper into the Congressional Record concerning the hidden costs of industrial pollution and the use of effluent charges to encourage industry to abate pollution. The paper is entitled 'Incentives for Industrial Pollution Control'. The author postulates first that single companies find the cost-benefit ratio of pollution control unsatisfactory, because the benefits to downstream riparians are not included in the calculations. However, the overall cost to the public of failure to begin pollution abatement is found to be much higher than the cost to the single industry. It is observed that forestalling assertion of public authority for pollution is an incentive for voluntary pollution abatement, but voluntary abatement has been unsuccessful. The author advocates establishing 'pollution quotas' among cities and industries, enforceable by effluent charges, to achieve an acceptable standard of stream water quality. The charges would vary inversely with the relationship of pollution to the quality standard. The advantages of the effluent-charge system are stated to be: (1) free choice by industry; (2) inducement to develop low cost pollution control measures; and (3) flexibility. (Hart-Florida)
W71-08986

REGULATION OF PUBLIC USE OF RESERVOIR AREAS.
Corps of Engineers, Washington, D.C.

Code of Federal Regulations, Title 36, Chap III, Part 311 (1970). 7 p.

Descriptors: *Reservoirs, *Public rights, *Regulation, *Administrative agencies, Administration, Water resources development, Recreation, Boating, Swimming, Hunting, Fishing, Environmental sanitation, Public health, Water pollution, Sewage, Wastes, Federal government, State governments, Permits, Navigable waters, Access routes, Boats, Boating regulations, Water supply.

These regulations issured by the Department of the Army govern public use of certain reservoir areas with respect to such matters as : (1) various boating activities, (2) swimming, (3) hunting, (4) fishing, (5) camping, (6) access to water areas, (7) pollution of waters, (8) sanitation, and (9) recreational activities. The regulations first list the states and projects within the states to which they are applicable. Commercial boating is prohibited except as specifically authorized by the Department of the Army. Private boating on reservoirs for fishing and recreational use is permitted except where prohibited by the District Engineer. Various sections cover such things as safety of boats and types of boats permitted on reservoir waters. All boats must be securely moored when not in use. No vessel shall discharge sewage, garbage, or other pollutants into the waters of a reservoir, except in accordance with state and local health agency standards permitting such discharges in deep waters. Swimming and bathing are permitted except in areas designated by the District Engineer. The regulations list the requirements for hunting and fishing and the areas where such activity may be prohibited. Rights of public access to water areas are enumerated. No refuse or wastes may be deposited in reservoir areas except at designated points or places designed for sanitary disposal. (Duss-Florida)
W71-08987

LIABILITY FOR OIL POLLUTION CLEANUP AND THE WATER QUALITY IMPROVEMENT ACT OF 1970,
For primary bibliographic entry see Field 05G.
W71-08988

THERMAL ELECTRIC POWER AND WATER POLLUTION: A SITING APPROACH,
For primary bibliographic entry see Field 05G.
W71-08989

WHO'S RESPONSIBLE FOR POLLUTION,
James Marshall.
American Bar Ass'n Journal, Vol 57, p 21-26 (1971). 6 p.

Descriptors: *Water pollution, *Pollution abatement, *Environmental effects, *Legal aspects, Legislation, Remedies, Environment, Ecology, Air pollution, State governments, Federal government, Local governments, Technology, Navigable waters, Sewage, Natural resources, Water supply, Pesticides, Administrative agencies, Water pollution sources, Industrial wastes, Costs, Damages, Balance of nature.
Identifiers: Refuse Act, *Administrative Procedure Act, *National Environmental Policy Act.

Considering the great threat posed to our society by various types of pollution, this article concentrates its attention on the legal responsibility for pollution and the legal safeguards which exist or should be enacted in order to prevent pollution. The author first considers the interrelationship of different polluters and the cumulative effect which various types of pollution have upon our environment. Different branches of government, industry, and consumers receive attention. In the past, corporations and governments have omitted from their balance sheets the cost to the nation resulting from activities which damage our environment. There is need to enact legislation which sets deadlines for cleaning up and preventing pollution. Legal remedies through court action provide one avenue for successful pollution control. The Refuse Act of 1899 is one example of legislation which provides for redress against polluters of navigable waterways. The author considers injunctive relief the best remedy for pollution damage. Several types of cases are cited and there is a discussion of the need to expand plaintiff's rights. The article concludes with a consideration of the Administrative Procedure Act and the National Environmental Policy Act, both of which may be of service in pollution control. (Duss-Florida)
W71-08990

THE PORTER-COLOGNE WATER QUALITY CONTROL ACT.
California State Water Resources Control Board, Sacramento, Calif.
For primary bibliographic entry see Field 05G.
W71-08991

CLEAN LAKES ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).

Senate Bill 1017, 92d Cong, 1st Sess (1971). 9 p.

Descriptors: *Water pollution control, *Lakes, *Grants, *Treatment facilities, Water pollution, Water pollution sources, Water treatment, State governments, Federal government, Administrative agencies, Water quality, Water quality control, Discharge (Water), Cities, Legal aspects, Pollutants, Pollution abatement, Financing.
Identifiers: *Clean Lakes Act.

The proposed Clean Lakes Act of 1971, a bill to amend theFederal Water Pollution Control Act, is designed to improve the quality of fresh water navigable lakes in both urban and rural areas, with special emphasis upon small community lakes. The Administrator of the Environmental Protection Agency is authorized to increase state grants for modern treatment works discharging into lakes where enforceable water quality standards have been approved by the Administrator. One-hundred fifty million dollars is appropriated for the increased grants. Additionally, technical and financial assistance may be provided for approved pollution abatement programs for lakes. Various criteria for approving applications are promulgated. Furthermore, appropriations and provisions for the Secretaries of Agriculture and the Army to furnish personnel, services, and facilities at state request are given. Discharge of waters into approved lakes in violation of established water quality standards is prohibited. Knowing violation is a criminal offense, and penalties are prescribed. Provisions for civil relief by injunction or restraining order are also given. (Hart-Florida)
W71-08992

A BILL TO AMEND THE PUBLIC HEALTH SERVICES ACT TO PROHIBIT THE DISCHARGE OF ELEMENTAL MERCURY AND ITS COMPOUNDS INTO ANY WATERS OF THE UNITED STATES WHICH DIRECTLY AFFECT THE PUBLIC HEALTH.

House Bill 130, 92d Cong, 1st Sess (1971). 3 p.

Descriptors: *Public health, *Chemical wastes, *Water pollution sources, *Discharge (Water), Inorganic compounds, Metals, Toxins, Legislation, Water pollution, Pollution abatement, Pollutants, Water pollution control, Water quality, Water quality control, United States, Administration, Administrative agencies, Legal aspects, Regulation, Federal government.

Discharge of elemental mercury or mercury compounds into any United States waters is prohibited by this proposed amendment to the Public Health Services Act. All previous licenses, permits, or authorizations for discharge of mercury compounds or mercury are terminated, and further authorization may not be granted. A fine of $10,000 may be imposed for violation of the Act, for continuing violations, each day is a separate offense. Furthermore, federal district courts are given authority to restrain violation, and failure to obey a court order is punishable as contempt. (Hart-Florida)
W71-08993

EMERGENCY WATER POLLUTION PREVENTION ACT OF 1971 (A BILL TO ESTABLISH AN IMMEDIATE PROGRAM FOR THE PREVENTION OF OCEAN POLLUTION).
Senate Bill 1286, 92d Cong, 1st Sess (1971). 4 p.

Descriptors: *Water pollution, *Oceans, *Waste disposal, *Water quality control, United States, Federal government, Legislation, Legal aspects, Water pollution control, Pollution abatement, Pollutants, Administrative agencies, Contiental shelf, Admiralty, Ships, Regulation.

Loading of vessels with any material for ocean disposal would be immediately prohibited by this proposed amendment to the Federal Water Pollution Control Act. The bill is entitled the Emergency Water Pollution Prevention Act of 1971. Further regulations would be promulgated by the Administrator of the Environmental Protection Agency to govern issuance of permits for ocean disposal only when it is not harmful to the environment and is beyond the Continental Shelf and United States waters. The civil penalty for violation of the Act is a $25,000 fine; vessels are liable in rem for the civil penalty. The terms 'master', 'owner', 'ocean waters', and 'vessel' are defined in the Act. (Hart-Florida)
W71-08994

OIL SPILL PREVENTION AND POLLUTION CONTROL.
Fla Stat Ch 376 (Supp 1970). 7 p.

Descriptors: *Florida, *Water pollution, *Oil, *Administrative agencies, Legislation, Regulation, Pollution abatement, Pollutants, Water pollution control, Water quality, Water quality control, Ships, Oily water, State governments, Damages, Adminstration.

The Oil Spill Prevention and Pollution Control Act complements federal legislation in the same area. The Act states the duties of the department of natural resources and provides definitions of crucial terms. Discharge of all petroleum products in coastal waters is prohibited. Operation of unlicensed terminal facilities is prohibited. The regulatory powers of the department of natural resources are set forth; the department is directed to promulgate certain regulations. The Act also prescribes the duties of port managers in preventing oil pollution by vessel inspection. Moreover, persons making prohibited discharges are directed to remove the prohibited materials to the department's satisfaction. Other provisions for removal of prohibited discharges are established. The department is directed to maintain sufficient personnel and equipment to implement the Act's requirements. The Florida Coastal Protection Fund is established to implement the Act. Licensees are liable to the state for costs of clean-up activities resulting from prohibited discharges. Other provisions include: (1) bonding requirements for vessels and terminal facilities, (2) derelict vessels, (3) enforcement and penalties, (4) legislative reports, (5) budget approval, (6) limitation on local ordinances, (7) limitation on application of the Act, and (8) the governor's emergency powers. (Hart-Florida)
W71-08995

HEINZ V BOROUGH OF ESSEX FELLS (CITY'S LIABILITY FOR DISCHARGING OIL INTO STREAM).
151 A 593-594 (Ct Err and App NJ 1930).

Descriptors: *New Jersey, *Water pollution, *Oil, *Cities, Water pollution effects, Water pollution sources, Water quality, Pollutants, Legal aspects, Judicial decisions, Oily water.

Plaintiff farmowner sued defendant city for damages from stream pollution. The stream was unfit for consumption by domestic animals, and the oil in the stream had ignited and burned the fence in plaintiff's pasture. Discharge from a pumping station was the primary source of the oil, but some pumping station oil was also dumped on nearby roads and could have been washed into the stream. Following a lower court verdict for plaintiff, defendant objected to a jury charge which stated that defendant had no right to discharge oil from its pumping plant into the stream or upon the roads to plaintiff's detriment. Defendant asserted the charge deprived it of the exemption of municipalities from liability for governmental functions. The New Jersey Court of Errors and Appeals held that the charge was proper and stated the general rule to be that a municipality is immune from liability for strictly governmental functions only when it is free from any active wrongdoing. (Hart-Florida)
W71-08996

AN ACT RELATING TO SANITARY SEWAGE DISPOSAL UNITS: OCEAN OUTFALL AND DISPOSAL WELL TREATMENT REQUIREMENTS.
Fla Laws ch 70-82, p 199-200 (1970). 2 p.

Descriptors: *Florida, *Water pollution control, *Treatment facilities, *Sewage disposal, Legislation, Legal aspects, Disposal, Treatment, Ultimate disposal, Municipal wastes, Supervisory control (Power), Organic wastes, Pollutants, Sewage effluents, Sewage sludge, Waste water (Pollution), Environmental sanitation, Pollution abatement, Sanitary engineering, Oceans, Administration, Administrative agencies, Administrative decisions, Adoption of practices, State jurisdiction.

No state agency, county, special district, or municipality shall approve construction of sanitary sewage ocean outfalls or disposal wells not providing for secondary treatment of wastes. Additional advanced treatment may be ordered by the Department of Air and Water Pollution. Existing outfalls and wells shall provide secondary and necessary additional advanced treatment by January 3, 1974. Failure to conform shall be punishable by a five hundred dollar fine for each twenty-four hours, or fraction therof, of continued violation. (Earl-Florida)
W71-08999

TAX CREDITS FOR EXPENDITURES ON POLLUTION ABATEMENT FACILITIES.
Public Act No 291, Connecticut Legislative Service, p 317-318 (1969). 2 p.

Descriptors: *Connecticut, *Taxes, *Pollution abatement, *Waste treatment, Water pollution, Water pollution control, Water quality, Water quality control, Industrial wastes, State governments, Financing, Costs, Equipment.

Five per cent of expenditures for construction, rebuilding, acquisition, or expansion of facilities for treatment of industrial waste shall be allowed as tax credits in the year of expenditure under the recently enacted Connecticut legislation. If the credit allowed exceeds the amount of pre-credit tax, the excessive amount may be carried over into the succeeding four years. (Hart-Florida)
W71-09016

REGULATION OF DRILLING FOR AND DISPOSAL OF SALT WATER.
Act 111, Acts of Arkansas, p 316-318 (1969). 3 p.

Descriptors: *Arkansas, *Drilling, *Saline water, *Wells, Permits, Natural gas, Oil, Regulation, Drainage, Public health, Water pollution, Administrative agencies, Legislation, Seepage, Water pollution control.

Amending the Arkansas act relating to the regulation of drilling for and disposal of salt water, the Act empowers the Arkansas Oil and Gas Commission to regulate such activities. With respect to oil and gas development it is the purpose of the Act to prevent within each developed unit such reasonably avoidable drainage as is not equalized by counter drainage. With respect to well drilling for the production and disposal of salt water, the Commission shall have jurisdiction and authority over all persons and property to the extent necessary to effectuate the purposes of the Act. Among the purposes of the Act are: (1) to require operators to obtain permits from the Commission before drilling

or salt water; (2) to regulate drilling methods so as prevent the escape of salt water out of one ratum into another, the intrusion of salt water to oil and gas strata, and the pollution of fresh ater supplies by salt water; (3) to require the aking of reports to the Commission regarding illing; and (4) to regulate other aspects of drilling order to minimize the dangers involved with re- ard to natural resources and public safety. (Duss- orida)
71-09031

N ACT TO PROHIBIT THE SURFACE ISCHARGING SALTWATER ON THE SUR- ACE OF LANDS; TO PROHIBIT TAX DEDUC- ONS TO THOSE WHO DISCHARGE SALT- ATER: AND FOR OTHER PURPOSES.
ct 254, Acts of Arkansas, p 795-796 (1969). 2 p.

escriptors: *Arkansas, *Oil industry, *En- oachment, *Water pollution sources, Well regu- ions, Saline water-freshwater interfaces, epage, Wells, Mining, Oil wells, Salinity, Legisla- n, Taxes, Secondary recovery (Oil), Injection, l fields, Oil, Saline water, Groundwater, Fresh- ter, Streams, Water pollution control, Pollution atement, State governments, Legal aspects.

der this Act, tax deductions are denied oil-well erators who allow injected saltwater to escape d enter streams. The Act is applicable to in- iduals, partnerships, and corporations or em- yees who willfully or negligently cause or rmite saltwater to flow, seep, or otherwise escape m leased premises. Any individual can file a mplaint and secure a hearing before the Pollu- n Control Commission for violations of this Act. on a finding that the accused has violated this t tax deductions, under Acts 57 and 138 of 59, shall be denied for one year. Any violation ring a period of suspension shall extend the pension for one year from the last violation. ould any stream contain more than 250 parts per lionth of chlorides, the Pollution Control Com- ssion shall seek and take steps to eliminate the rce of such pollution. (Earl-Florida)
1-09040

ANCHISE TAX DEDUCTIONS FOR COST OF TI-POLLUTION DEVICES, SYSTEMS AND CILITIES.
No 1138, Acts of Alabama p 2126-2128 69). 3 p.

criptors: *Alabama, *Taxes, *Pollution abate- nt, *Treatment facilities, Water pollution, Air lution, Water pollution control, Water pollution tment, Government finance, Tax rate, State ernments, Legislation, Industries, Legal ects, Financing.

purposes of computing the franchise tax on ign corporations, a prior act is amended to in- le new deductions for anti-pollution devices. cost of all devices, systems and facilities used laced in operation in the state primarily for the tection of the public interest through the abate- t of air and water pollution shall be allowable deductions in computing the franchise tax. iljanich-Florida)
1-09042

TE SALES TAX EXEMPTION FOR OCEEDS FROM THE SALE OF ANTI-POL- TION DEVICES, MATERIALS, SYSTEMS D FACILITIES.
No 1139, Acts of Alabama, p 2128-2131 69). 4 p.

criptors: *Alabama, *Taxes, *Pollution abate- t, *Prices, Treatment facilities, Water pollu- Air pollution, Water pollution control, Water tion treatment, Government finance, Tax rate, e governments, Income, Net income, Costs, As- ements, Legislation, Industries, Legal aspects, ncing.

A prior act exempting certain items from state sales taxation is hereby amended to include exemptions for the sale of anti-pollution devices or materials. In computing the amount of state sales tax levied, the gross proceeds from the sale of all devices, materials, systems or facilities used or placed in operation in the state primarily for the protection of the public interest through the abatement of air and water pollution shall be exempted from taxation. (Smiljanich-Florida)
W71-09064

WATER LAW: BACKGROUND AND TRENDS,
Arizona Univ., Tucson.
R. E. Clark.
Paper National Meeting, American Society of Civil Engineers, Technical Sessions of the Sanitary Engineering Division, Phoenix, Ariz, Jan, 1971. 25 p, 55 ref.

Descriptors: Laws, *Legal aspects, *Legislation, Groundwater, *Water law, Water conservation, Groundwater depletion, Groundwater management, Water allocation (Policy), Administration, *Water management (Applied), Water pollution, Water quality, Water resources, Bibliographies, Water rights, Interstate compacts, Appropriation (Water rights), Agriculture.
Identifiers: Water availability, Colorado River Compact, National Water Resources Council, Central Arizona Project.

Water laws have evolved or have been refined through successive approximations, more inclusive generalizations, and verified hypotheses. The first water laws in the US emerged from common law and practices of miners, farmers, and pioneers. Most water laws have grown unevenly out of necessity, compromise, and pressure. Water laws in several states do not take into account groundwater or the interrelationship between surface and groundwater, and until a few years ago, all but ignored water quality. Today there is good reason for reexamination of the water resources policy. Problems of uneven distribution of supply and shortages, allocation, preferences, waste, quality, and monopoly require more attention. Trends toward improvement can be seen in some of the problem areas. (USBR)
W71-09077

LIGHTNER V CITY OF RALEIGH (DAMAGES FROM SEWAGE EMPTIED INTO CREEK ADJACENT TO PRIVATE PROPERTY).

206 NC 496, 174 SE 272-278 (1934).

Descriptors: *North Carolina, *Waste water (Pollution), *Sewage disposal, *Municipal wastes, Cities, Judicial decisions, Legal aspects, Damages, Remedies, Flood damage, Easements, Prescriptive rights, Streams, Degradation (Stream), Streamflow, Water pollution, Water pollution sources, Waste water disposal, Waste disposal, Sewage.

Plaintiff landowners sued defendant city for damages resulting from the emptying of sewage into a creek adjacent to their property. Defendant was using this creek as a sewage outlet when plaintiffs purchased the land, but many new sewage outlets into the creek were constructed after plaintiffs' acquisition of the land. During rains or floods raw sewage was deposited on plaintiffs' land. Defendant argued that it had acquired a prescriptive right to dump sewage in the creek and that plaintiffs' claim was barred by the statute of limitations. Defendant also maintained that it had an easement. The jury rendered a verdict for defendant. The Supreme Court of North Carolina affirmed, holding that a verdict on conflicting evidence is binding on appeal. The court also found that plaintiffs were entitled to sue for permanent damage but were limited by the statute of limitations to damages suffered within three years prior to the commencement of the action. The measure of permanent damages would be the difference in value of the land before and after the alleged damage. (Robinson-Florida)
W71-09085

TOWN OF SMITHFIELD V CITY OF RALEIGH (CITY'S DISCHARGE OF RAW SEWAGE INTO ANOTHER CITY'S WATER SOURCE).
207 NC 597, 178 SE 114-116 (1935).

Descriptors: *North Carolina, *Water pollution sources, *Water supply, *Sewage disposal, Judicial decisions, Legal aspects, Wastes, Waste disposal, Waste water (Pollution), Waste water disposal, Water pollution, Water rights, Water sources, Water resources, Water utilization, Water users, Sewage, Sewers, Streams, Rivers, River flow, Cities, Remedies, Legislation.

Plaintiff town brought an action to enjoin defendant city from discharging untreated sewage into creeks that fed the Neuse River, from which plaintiff derived its water supply. Defendant had no modern sewage treatment plant, and the discharge of raw sewage was a statutory violation. Plaintiff operated a water treatment plant which extracted and treated water from the river. Defendant was a much larger city than plaintiff and plaintiff had not suffered harm. Plaintiff alleged that such discharges were a menace to the health of its citizens, and defendant alleged that there was no menace or detriment to plaintiff. The trial court denied plaintiff's petition. The Supreme Court of North Carolina affirmed, after weighing the relative hardships of the inhabitants of both cities. The court further held that defendant must comply with the statute prohibiting such discharges even though temporarily excused because of financial conditions. Actual injury is not required to enjoin a municipality from discharging raw sewage into another town's water source; a threat of harm is sufficient. (Robinson-Florida)
W71-09107

KELLUM V VILLAGE OF GREENUP (UNRECORDED EASEMENT TO DISCHARGE SEWAGE).
265 Ill App 24-26 (1932).

Descriptors: *Illinois, *Pollution abatement, *Easements, *Municipal wastes, Fouling, Odor, Sewage sludge, Sewers, Sewage disposal, Water rights, Sewage effluents, Water pollution, Pollutants, Legal aspects, Judicial decisions, Sewage, Fresh water.

Plaintiff landowner sought to enjoin defendant village from discharging sewage into an open watercourse on property which she operated as a dairy. Defendant operated a sewer which emptied into an open stream crossing plaintiff's land. The evidence showed that the stream became so polluted that: (1) the cows crossing the stream had to be cleaned before they could be milked; (2) deposits of sewage and sludge beds were formed on the land and, at times, emitted an offensive odor; and (3) plaintiff had made numerous complaints to defendant. Defendant claimed that it had purchased an easement from the former owners before they sold the land to plaintiff. The alleged easement granted to defendant the right to carry sewage across the premises. The evidence showed that such an easement was never recorded and plaintiff had no knowledge of it. The easement granted only the right to lay the sewer across plaintiff's land and did not give defendants the right to run the sewage into the open stream. The Appellate Court of Illinois found that the evidence supported the trial court's granting of the injunction. An unrecorded easement was held to be no defense to such an action. (Johnson-Florida)
W71-09155

MILLER V MOBILE AND OHIO RR (INADEQUATE DRAIN BENEATH RAILROAD EMBANKMENT).
265 Ill App 414-420 (1932).

Descriptors: *Illinois, *Floods, *Obstruction to flow, *Storm runoff, Repulsion, Tile drainage, Rain water, Legal aspects, Judicial decisions, Watersheds (Basins), Water rights, Drainage systems, Flood control, Flood damage, Maximum

probable flood, Precipitation excess, Streams, Runoff, Drainage, Drains.

Plaintiff's land was in a basin bordered on one side by defendant railroad's embankment. A stream passed under the railroad north of plaintiff's land. Defendant's trestle crossing the stream had previously been sufficient to allow any overflow to pass through. Defendant later filled the trestle with earth and constructed a five-foot drain to carry the water through the embankment. The drain was insufficient to carry the natural flow of water resulting from frequent rains over a short period. Plaintiff's land was flooded, and he sued for the damages. The U.S. Appellate Court of Illinois held that there could be no recovery for damages if the rains were unprecedented acts of God, unless defendant was guilty of negligence which was a proximate cause of the damage. The jury found that the rains were not unprecedented and the court felt that the use of the five-foot drain in place of the trestle might have been negligent. One who restrains the flow of water must provide for the consequences of heavy rainfall and will be liable if he fails to do so. (Johnson-Florida)
W71-09162

LOVE V NASHVILLE AGRICULTURAL AND NORMAL INSTITUTE (MEASURE OF DAMAGES FOR SPRING POLLUTION).
6 Tenn App 104-111 (1927).

Descriptors: *Tennessee, *Springs, *Water pollution, *Damages, Water pollution sources, Water pollution effects, Pollutants, Sewage, Rent, Mineral water, Spring waters, Judicial decisions, Legal aspects.

Plaintiff landowner sought an injunction to prevent defendant school from discharging sewage so that his sulfur spring was contaminated and damages for both loss of profits from sales of the sulfur spring water and depreciation of this property. From a lower court decision holding defendant liable, both parties appealed on the measure of damages. Plaintiff contended that the lower court should have considered damages for diminished reputation of his spring water, depreciated property value, and lost profits from water sales. Conversely, defendant contended that the chancellor did not consider contamination from other sources, and that he erred in holding that defendant must prove contamination from other sources. The Tennessee Court of Appeals held that plaintiff could not obtain the special damages, since they were not pleaded and proven. As to defendant's assignments of error, the court held that defendant had the burden of proving other sources of contamination and what portion of the injury was caused by other sources. General rules for measuring damages for both permanent and temporary injuries were outlined by the court. (Hart-Florida)
W71-09166

FIRST TRUST CO V PEPPER BROS (RECOVERY OF DAMAGES FOR DESTRUCTION OF ICE CROP BY OIL POLLUTION).
235 App Div 750, 256 NYS 752-753 (1932).

Descriptors: *New York, *Ice, *Oil, *Damages, Water pollution, Impaired water quality, Gasoline, Water pollution sources, Industrial wastes, Oily water, Judicial decisions, Legal aspects, Water pollution effects.

Plaintiff brought suit to recover damages for injury to his ice crop. These damages were allegedly sustained by reason of defendant's permitting lubricating oil from its gasoline pumps to enter a creek. A verdict for plaintiff was entered at the trial term. On appeal the Supreme Court of New York found sufficient evidence to sustain the verdict for plaintiff as to liability, but not as to the amount of damages. The court stated that the jury could not award damages for water diverted, for loss of domestic water supply, or for loss of plaintiff's customers. The only elements of damage allowable were loss of ice harvest, loss by extra shrinkage of the ice actually harvested due to failure to fill the icehouse, and the expense of harvesting and insuring such extra shrinkage ice. Upon determination of the value of such damages the court found the award must be reduced. (Barnett-Florida)
W71-09169

CITY OF HARRISONVILLE V W S DICKEY CLAY MFG CO (REMEDY FOR MUNICIPAL POLLUTION OF PRIVATE PROPERTY).
289 US 334, 53 S Ct 602-605 (1933).

Descriptors: *Missouri, *Municipal wastes, *Sewage treatment, *Sewage effluents, Remedies, Judicial decisions, Legal aspects, Damages, Streams, Local governments, Farms, Sewage disposal, Pipes, Water pollution, Water pollution sources, Pumping plants, Cities.

Plaintiff manufacturing company sought damages from defendant city and an injunction to stop defendant from discharging effluent into a creek on a stock farm plaintiff owned. Defendant had removed 60 per cent of the organic matter from the effluent and it would cost $30,000 to build a secondary treatment plant to remove another 30 per cent of the matter. The lower appellate court barred an injunction, and plaintiff appealed, contending that the injunction should be granted because the discharge constituted a permanent nuisance. Defendant argued that damages for depreciation in property value was the proper remedy. The United States Supreme Court held that the discharge was a nuisance, but that in this case an injunction was not the proper remedy because it would work disproportionate hardship on defendant. The farm's loss in rental value could be remedied by money damages. The Court also held that the disposal plant was not a permanent nuisance since secondary treatment could be added. The case was remanded for determination of damages. (Morris-Florida)
W71-09170

FRANK TEA AND SPICE CO V L SCHREIBER AND SONS CO (PROPERTY DAMAGES FROM BLOCKAGE OF SEWER BUILT TO REPLACE NATURAL STREAM).
20 Ohio App, 151 NE 801-802 (1925).

Descriptors: *Ohio, *Municipal wastes, *Sewers, *Drainage systems, Legislation, Cities, Storm drains, Sewage disposal, Flood damages, Surface waters, Running waters, Natural streams, Waste disposal, Pumping, Riparian rights, Easements, Environmental sanitation, Public health, Waste disposal.

The city of Cincinnati built a drain running through all property bordering on Deer Creek. The creek was filled and the drain lay 50 feet below the surface. The drain was never made a part of the city sewer system, although it was used as a storm drain. Prior judicial opinions clarified the purpose of the drain: to replace the creek by superseding it with a sewer which to each property owner should be a quasi-natural stream, subjecting each to no new obligations. Plaintiff property owner sought to enjoin defendant's dumping sewage into the drain and to recover damages resulting from pumping out his basement, which was flooded as a result of blockage in the drain. The Court of Appeals of Ohio denied recovery of damages, finding that: (1) there was no rational means to assess the amount of damages caused by defendant since his sewage was in small proportion to the volume claimed to have been pumped out; and (2) it was possible that plaintiff failed to use due care while pumping to minimize damages. Defendant was enjoined from using the drain to dispose of sewage, since such use directly contravened the health regulations of the state set forth in a sanitary code. (Rees-Florida)
W71-09175

JOYCE-WATKINS CO V INDUSTRIAL COMM'N (LOW-WATER MARK AS BOUNDARY BETWEEN COTERMINUS STATES).
325 Ill 378, 156 NE 346-349 (1927).

Descriptors: *Illinois, *Low water mark, *Boundaries (Property), Bank erosion, Channel erosion, Rivers, Thread of the stream, Boundary disputes, Kentucky, Railroads, Working conditions, Personnel, Employment, Compensation, Accretion (Legal aspects), Ownership of beds, Ohio River.

Defendant employee was injured on plaintiff employer's railway that extended 260 feet into the Ohio River at a point 10 feet from the water's edge. Plaintiff contended the injury occurred outside the jurisdiction of Illinois, rendering an Illinois compensation award invalid. The Illinois Supreme Court held that the question of a boundary line between Illinois and Kentucky could not be determined, since Illinois was not a party to the action. However, the court did decide that the low-water mark of the river, constituting the boundary between these coterminus states, was not a permanent line. The court took judicial notice that the Ohio River varies in water level. It ruled that when a stream dividing coterminus states alters its course by a gradual process of alluvion, the boundary shifts with the stream. However, alteration by sudden changes leaves the boundary in the river's middle. Testimony from experienced riverme established the various levels of the Ohio River; the court concluded that the injury occurred north of the low-water mark. The compensation award by the Illinois Industrial Commission under the state Workmen's Compensation Act was upheld. (Rees-Florida)
W71-09176

NAGY V CITY OF AKRON (MUNICIPAL SURFACE WATER DRAINAGE).
27 Ohio App 250, 161 NE 226-228 (1927).

Descriptors: *Ohio, *Surface drainage, *Storm runoff, *Surface runoff, Judicial decisions, Surface waters, Laterals, Storm drains, Damages, Drainage, Drainage water, Drainage systems, Legal aspects.

Plaintiff landowner sued defendant city for damages to his crops caused by overflow from a county drainage lateral which passed through plaintiff's land. Plaintiff's complaint alleged that the overflow resulted from defendant's storm water sewer emptying into the lateral at a point 1000 feet outside defendant's corporate limits. The lateral was a watercourse under Ohio law. Defendant denied liability because only the flow and not the drainage area of the lateral had been increased by defendant's storm sewer drainage. The trial court sustained defendant's demurrer and the Court of Appeals of Ohio reversed. The court treated defendant municipality as an individual landowner in applying the civil law rule for surface water drainage. While acknowledging the rule that a landowner may, without liability, drain surface water into a natural watercourse upon his land and thus increase the volume and flow of the watercourse, the court pointed out that the watercourse in the instant case did not at any point come within defendant's corporate limits. The court therefore held plaintiff's complaint to state a cause of action. (Madsen-Florida)
W71-09187

PRIVATE REMEDIES FOR WATER POLLUTION.
Columbia Law Review, Vol 70, p 734-756, 1970.
23 p, 139 ref.

Descriptors: *Water pollution control, *Water quality control, *Remedies, *Social impact, Riparian rights, Legal aspects, Water law, Reasonable use, Natural flow doctrine, Water pollution, Water quality, Administration, Administrative agencies, Administrative decisions, Judicial decisions, Water policy, Industrial wastes, Social values, Political aspects, Damages, Legislation.

he following common law bases of a cause of action for water pollution are discussed: (1) riaprian ghts, (2) public nuisance, and (3) private uisance. Recovery of damages and suits for inctive relief are also considered. Available defens and their effect on these actions are examined. rivate actions based on statutes and constitutional rovisions are next considered. The possibility of hallenge by private individuals to administrative ction in environmental control is evaluated. hough federal and state pollution programs are ecoming increasingly important, private litigation ill provides economic and political stimulants to overnment and industry and fills gaps and rnishes individual remedies where pollution proams lack specificity. Private litigation also points t relevant issues to legislators and administrators. ctions for damages will encourage private indus- to reevaluate the social costs of pollution, and ass actions can increase this economic pressure. he author concludes that while comprehensive ans must come from the legislature, the courts ust educate and coerce compliance with new enronmental standards. (Robinson-Florida)
71-09195

UMPING GROUND REGULATIONS (REGUATION OF DUMPING IN INTEREST OF AVIGATION).
de of Federal Regulations, Title 33, Chap 11, rt 205 (1970). 14 p.

escriptors: *Navigable waters, *Navigation, Vaste disposal, *Waste dumps, Bodies of water, gulation, Inspection, Permits, Standards, Moniing, Administrative agencies, Administration, ater pollution, Pacific Ocean, Atlantic Ocean, vigable rivers, Great Lakes, Dredging, Wastes, sts, Federal government.

an effort to control the dumping of waste materi- into various navigable bodies of water, these leral regulations delineate: (1) the types of terials which may be dumped, (2) the areas ere they may be dumped, (3) procedures for obning permission to dump waste materials, and methods for regulating permissible dumping. dies of water covered by these regulations inde: (1) New York Harbor and adjacent waters; the Chesapeake Bay off Kent Island, Maryland; Ashley River and Charleston Harbor, South rolina; (4) Lake Michigan around Chicago, Ilois; (5) Lake Superior in Minnesota and Wiscon; (6) the west end of Lake Erie; (7) various apaches to bays and rivers in the Pacific Ocean; (8) entrances to seaports. The primary aim of regulations is to assure unhindered navigation hese waters, although pollution control appears e an additional factor. In all waters covered the nping of floatable wastes or wastes easily transted by currents is prohibited. In many waters tallic objects may not be dumped. Various visions prescribe methods of obtaining dumping mits, supervisory control of the dumping, and ection of dumping areas. (Duss-Florida)
1-09196

DERAL AID TO STATES IN FISH AND WILIFE RESTORATION.
le of Federal Regulations, Title 50, Chap 1, part (1970). 7 p.

criptors: *Government finance, *Fish managent, *Wildlife management, *Wildlife conserva, Administrative agencies, Regulation, Grants, e governments, Administration, Contracts, ter pollution, Water pollution control, Pollution tement, Fish conservation, Federal project polPermits, Project planning.

federal government is authorized to pay 75 per t of the cost of authorized state projects for fish wildlife restoration. Aid funds granted under Federal Aid Acts must be used to implement approved projects. The program is adistered by the Department of the Interior, se regulations provide for: (1) apportionment certification of available funds; (2) notice of desire to participate in the program; (3) period of fund availability; (4) diversion of funds from authorized projects; (5) information to be furnished the Department concerning state wildlife laws and the number of holders of hunting and fishing licenses; (6) prohibited activities; (7) uses other than fish and wildlife restoration; (8) minimum federal participation (10%); (9) project statement; (10) financial plans; (11) plans, specifications and estimates; (12) project agreements; (13) officials not to benefit from federal aid; (14) equal employment opportunity; (15) submission of documents; (16) divergence of opinions over project merits; (17) contracts; (18) safety; (19) production of income; (20) civil rights; (21) inspection; (22) payments of federal aid; (23) vouchers; (24) records and reporting; (25) use of convict labor; (26) avoidance of water pollution; (27) patents; and (28) fish and wildlife planning. In the performance of approved projects states must take necessary action to avoid water pollution as a direct or indirect result of project activity. (Hart-Florida)
W71-09197

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
Public Law No 91-224, 84 Stat 91, 4 US Code Cong and Admin News, p 539-570 (1970). 32 p.

Descriptors: *Water pollution, *Environment, *Water quality, *Administrative agencies, Water pollution control, Oil, Oil industry, Oil fields, Pollutants, Pollution abatement, Water pollution sources, Water pollution effects, Sewage, Sewage disposal, Ships, Acid mine water, Mine water, Mine wastes, Alaska, Grants, Government finance, Federal government, Lakes.

The first of two parts of the Water and Environmental Quality Improvement Act of 1970 is wholly concerned with water quality improvement. The topic initially covered in the water quality section is control of pollution by oil. Strict liability for oil pollution is the impetus of the section. Further water quality topics are: (1) control of hazardous polluting substances; (2) control of sewage from vessels; (3) area acid and other mine water pollution control demonstrations; (4) pollution control in the Great Lakes; (5) training grants and contracts; (6) applications for training grants or contracts; allocation of grants or contracts; (7) award of scholarships; (8) definitions and authorizations; (9) Alaska village demonstration projects; and (10) cooperation by all federal agencies in the control of pollution. The second part of the Act is devoted to environmental quality; after first stating the findings, declarations, and purposes of Congress in enactment, regulations are promulgated governing: (1) the Office of Environmental Quality; (2) environmental quality reports; and (3) authorized expenditures. (Hart-Florida)
W71-09198

LAW AND TAXATION--A GUIDE FOR CONSERVATION AND OTHER NONPROFIT ORGANIZATIONS.
Conservation Foundation, Washington, D. C.

The Conservation Foundation, Wash, DC, June 1970, 47 p, 7 ref.

Descriptors: *Taxes, *Conservation, *Environment, *Legal aspects, Legislation, Ecology, Financing.

Important considerations for any group created for the purpose of conservation or environmental improvement are the tax implications of the organizational form. This article attempts to provide a guide in these areas. The article begins with a discussion of the advantages and disadvantages of the corporate form with respect to taxation. Public foundations are defined. The emphasis is placed upon the tax situation of corporations, and particularly on the ways of securing and maintaining tax exempt status. Also included is a section devoted to the considerations of private foundations. (Duss-Florida)
W71-09199

WATER QUALITY ACT OF 1965 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO ESTABLISH THE FEDERAL WATER POLLUTION CONTROL ADMINISTRATION.
Senate Bill 4, 89th Cong, 1st Sess (1965). 11 p.

Descriptors: *Water Quality Act, *Water pollution control, *Pollution abatement, *Standards, Water pollution, Water quality control, Sewage disposal, Sewage treatment, Water resources development, Administration, Administrative agencies, Regulation, Water pollution treatment, Treatment facilities, Water allocation (Policy), Water conservation, Legislation, State governments, Municipal wastes, Industrial wastes, Cities, Local government, Grants, Research and development, Legal aspects.

In order to enhance the quality of water resources and establish a national policy for water pollution abatement, the Federal Water Pollution Control Act would be amended by this legislation to establish the Federal Water Pollution Control Administration. Grants would be authorized to states, municipalities and appropriate agencies for research and development of improved methods of sewage discharge, subject to various limitations. Provisions relating to appropriations would also be amended. Grants would be increased for construction of municipal sewage treatment works as part of comprehensive water quality plans. After consultation with the applicable federal or state agencies, the Secretary of Health, Education and Welfare would be authorized to prepare regulations setting forth water quality standards for interstate waters. In establishing such standards, the Secretary could take into consideration public water supply needs, propagation of fish and wildlife, recreational purposes, and other uses of the waters. Before the standards would be promulgated, states and interstate agencies would be given an opportunity to develop their own standards in accordance with the purposes of the Act. Discharge in derogation of water quality standards would be subject to abatement. (Smiljanich-Florida)
W71-09200

AN ACT FOR A COMPREHENSIVE WATER AND RELATED LAND RESOURCES MANAGEMENT PROGRAM (THE ARKANSAS WATER PLAN).
Act 217, Acts of Arkansas, p 682-693 (1969). 12 p.

Descriptors: *Arkansas, *Water resources development, *Administration, *Planning, Water resources, Land resources, Water management (Applied), Water policy, Project planning, Project purposes, Water allocation (Policy), Water supply, Water utilization, Financing, Government finance, Debt, Income, Institutions, State jurisdiction, State governments, Local governments, Administrative agencies, Legislation, Legal aspects.

The Arkansas Soil and Water Conservation Commission is directed by this Act to prepare, develop and engate the Arkansas Water Plan, a comprehensive program for the orderly development and management of the state's water and related land resources. The Commission is authorized to engage in any water development project that is to be included in the Plan. In using appropriated funds the Commission may provide the cost of planning, acquisition, construction and maintenance of the water development projects. The Commission is authorized to establish the Arkansas Water Development Fund, which shall be used to pay for the water development projects. Among the powers and duties of the Commission are the responsibility for the proper distribution and allocation of state water and for other necessary administrative functions. Provision is made for the creation and issuance by the Commission of

revenue bonds to secure the payment of the project costs, subject to various limitations. Penalties for violation of the Act are set forth. (Smiljanich-Florida)
W71-09201

STATE CORPORATE INCOME TAX DEDUCTIONS FOR AMOUNTS INVESTED IN ANTI-POLLUTION DEVICES, SYSTEMS AND FACILITIES.
Act No 1136, Acts of Alabama, p 2115-2122 (1969). 8 p.

Descriptors: *Alabama, *Taxes, *Pollution abatement, *Income, Treatment facilities, Water pollution, Air pollution, Water pollution control, Water pollution treatment, Government finance, Tax rate, State governments, Net income, Costs, Return (Monetary), Amortization, Legislation, Legal aspects, Industries.
Identifiers: *Tax deductions.

A prior act providing for certain state corporate income tax deductions is hereby amended to include deductions for anti-pollution devices. All amounts invested in devices, systems or facilities used or placed in operation in the state primarily for the protection of the public interest through the abatement of air and water pollution shall be allowable as deductions in computing the state corporate income tax. In lieu of such deduction the amounts invested may be amortized. Any deductions taken under this Act shall exclude all other allowable deductions for such investment. (Smiljanich-Florida)
W71-09202

AN ACT PROVIDING FOR TAXATION DEDUCTION OF COST OF POLLUTION ABATEMENT DEVICES.

Act No 1140, Acts of Alabama, p 2131-2134 (1969).

Descriptors: *Alabama, *Pollution abatement, *Taxes, *Assessments, Treatment facilities, Evaluation, Water pollution control, Water pollution, Air pollution, Water pollution treatment, Water quality control, Government finance, Tax rate, Property values, Legislation, Legal aspects, Non-structural alternatives.

An existing act providing for the taxation of corporations is by this act amended to include certain deductions. A corporation may deduct from the assessed value of its shares the assessed value of all devices, systems and facilities constructed, used or placed in operation in the state primarily for the protection of the public interest through the abatement of air and water pollution. Taxation shall be only on the assessed value of the remainder. (Smiljanich-Florida)
W71-09203

AN ACT PROVIDING FOR THE EXEMPTION OF STATE USE TAXATION OF POLLUTION ABATEMENT DEVICES OR FACILITIES.
Act No 1141, Acts of Alabama, p 2134-2136 (1969).

Descriptors: *Alabama, *Pollution abatement, *Taxes, *Treatment facilities, Water pollution control, Water pollution treatment, Air pollution, Water pollution, Water quality control, Government finance, Tax rate, Industrial plants, Legislation, Legal aspects.

An existing act providing for the exemption from the state use tax of certain property and proceeds is hereby amended to include pollution abatement devices. The storage, use or consumption of any devices, systems, facilities, or materials used or placed in operation within the state primarily for the protection of the public interest through the abatement of air and water pollution shall be exempt from state use taxation. (Smiljanich-Florida)
W71-09204

ENVIRONMENTAL IMPROVEMENT AUTHORITIES ACT OF 1969.
Act No 1117, Acts of Alabama, p 2060-2072 (1969). 13 p.

Descriptors: *Alabama, *Pollution abatement, *Institutions, *Water pollution, State governments, Administrative agencies, Water resources development, Administration, Management, Surveys, Planning, Water management (Applied), Water pollution treatment, Water quality control, Air pollution, Environmental sanitation, Local governments, Environment, State jurisdiction, Environmental effects, Taxes, Debt, Treatment facilities, Legislation, Legal aspects.

Authorization is hereby given for the creation of public corporations as authorities for the study, control, abatement and prevention of water, air or general environmental pollution. Such authorities may: (1) undertake engineering, technical, financial, legal, and other studies and surveys with respect to water and other environmental pollution problems and hazards; (2) construct, acquire, operate and control equipment, facilities and systems for the abatement of water and other environmental pollution problems; and (3) cooperate with and lend financial assistance to municipalities, counties and industries in matters and undertakings, the end purposes of which are pollution abatement. Procedures for incorporation are set forth, along with the composition of such corporations and certain tort immunities and tax exemptions. The authorities shall have normal corporate powers and may issue bonds secured by statutory mortgage liens to finance their operations. The public corporations shall cooperate with political subdivisions and other agencies and instrumentalities of the state whenever necessary. (Smiljanich-Florida)
W71-09205

AN ACT PROVIDING FOR THE INCORPORATION OF PUBLIC WATER, SEWER AND FIRE PROTECTION DISTRICTS.
Act No 29, Acts of Alabama, p 2630-2652 (1970).

Descriptors: *Alabama, *Water districts, *Public utility districts, *Sewage districts, Local governments, State governments, Water works, Water distribution (Applied), Water rates, Water supply, Sewage disposal, Municipal wastes, Sewage treatment, Treatment facilities, Eminent domain, Boundaries (Property), Debt, Loans, Investment, Government finance, Taxes, Legislation, Legal aspects.

Upon application to and authorization by a county or municipality, water, sewer and fire protection districts may be incorporated as public corporations for the provision of applicable services. Such districts are authorized to acquire, construct, operate, improve and finance water works plants, water distribution systems, sanitary sewer systems and fire protection facilities. The power of eminent domain is conferred on the districts. Provisions are set forth for the procedures of incorporation, the boundaries of the districts, their governance and other necessary powers. Procedures relating to the establishment, revision and collection of charges for the district services are included. Authorization is given for the financing of corporate purposes through interest bearing revenue bonds and other securities payable out of the revenues of the systems or facilities and secured by statutory mortgage liens. The districts may distribute and sell water, furnish and provide sewer and fire protection services, or perform such services in any combination. The districts shall be exempt from taxation and shall have certain tort liability immunities. Provisions for the dissolution of the districts and disposition of their property are also included. (Smiljanich-Florida)
W71-09206

CERTIFICATION OF WATER AND WASTE WATER TREATMENT PLANT OPERATIONS ACT.
General Act No 210, Georgia Laws, p 272-278 (1969). 7 p.

Descriptors: *Georgia, *Treatment facilities, *Operation and maintenance, *Management, Waste water treatment, Waste water disposal, Waste water (Pollution), Pollution abatement, Water pollution treatment, Water treatment, Water pollution, Employment, Engineering personnel, Occupations, Working conditions, Personnel, Leadership, Permits, Administrative agencies, Adjudication procedure, Administration, Legislation, Legal aspects.

In order to protect the public health and welfare and to conserve and protect the water resources of the state, this Act hereby requires the certification and examination of all water and waste water treatment plant operators. The State Board of Examiners for Certified Water and Waste water Treatment Plant Operators is created. The Board shall classify all public water supply systems and waste water treatment plants as to size, type, character of water to be treated, and other physical conditions indicating the skill, knowledge and experience that the operator must have to successfully operate each type of plant and prevent unlawful pollution. Provisions for application, examination and issuance of certificates to operators are included, and penalties for violations of the Act are prescribed. The Board may revoke the certificate of an operator, after a hearing, when it is found that the operator has practiced fraud or deception, that reasonable care was not used in the performance of his duties, or that the operator is incompetent or unable to properly perform his duties. Judicial review is provided for such revocations. (Smiljanich-Florida)
W71-09207

GUIDELINES FOR AGENCY STATEMENTS ON PROPOSED FEDERAL ACTIONS AFFECTING THE ENVIRONMENT.
Council on Environmental Quality, Wash, D.C.

Federal Register, Vol 36, No 79, p 7724-7729 (April 1971). 6 p.

Descriptors: *Administrative agencies, *Adoption of practices, *Environmental effects, *Federal project policy, Legislation, Administration, Regulation, Ecology, Environment, Federal government, Clean Air Act, Federal jurisdiction, Water quality control, Pollution abatement, Water resources, Natural resources, Water resources development, Water pollution, Air pollution, State governments, Local governments, Legal aspects.
Identifiers: *National Environmental Policy Act.

The Council on Environmental Quality herein provides guidelines to federal departments, agencies and establishments for preparing detailed environmental statements on proposals for legislation and other major federal actions significantly affecting the quality of the human environment as required by the National Environmental Policy Act. The objective of the guidelines is to build into the agency decisionmaking process an appropriate and careful consideration of the environmental aspects of proposed action, including proposed water quality standards, and to assist agencies in implementing the EPA. Prior to agency decision concerning major actions or recommendations that significantly affect the environment, federal agencies will, in consultation with other appropriate federal, state and local agencies, assess in detail the potential environmental impact. Agency procedures are provided for: the types of actions which will require such reports, state and local review of the environmental impact, and the content of the environmental statements. Guidance for implementation of the Clean Air Act is also provided. Appended hereto are forms which should accompany each environmental statement and a list of federal agencies with jurisdiction by law or special expertise to commen

n various types of environmental impacts. (Smil-nich-Florida)
/71-09208

NIMAL SLAUGHTERING AND PROCESSING.

ational Industrial Pollution Control Council, Sub-ouncil Report (Feb 1971). 14 p.

escriptors: *Animals, *Pollution abatement, Administrative agencies, *Industries, Industrial ater, Industrial wastes, Water pollution sources, /aste water treatment, Waste treatment, Water ollution, Pollutants, Water pollution control, esearch and development, Water quality, Water uality control.

he significant environmental problems which face e meat packing, poultry, rendering, and cattle eding and holding industries are identified in this eport. It also describes specific research and evelopment activities currently being conducted nd discusses economic and institutional ramifica-ons of pollution control upon the industries con-rned. The programs under way involve large ex-enditures for pollution control equipment, exten-ve research and testing, and close cooperation ith local, state, and federal government agencies esponsible for pollution control. Eutrophication nd odor control studies indicate that sampling, boratory methodology, and data collection chniques are essential to gaining knowledge for ffective research. Additionally, two areas capable significant impact upon reduction of treatable astes are: (1) water use reduction studies and ontrol programs, and (2) in-plant control pro-ams to reduce quantities of pollutants. (Hart-lorida)
/71-09209

EGIONALLY CONSOLIDATED INDUSTRIAL /ASTE WATER TREATMENT.

ational Industrial Pollution Control Council, Sub-ouncil Report (Feb 1971). 34 p, 4 fig, 1 tab.

escriptors: *Waste treatment, *Industrial wastes, Waste water (Pollution), *Waste water treatment, lunicipal wastes, Research and development, Re-ons, Industrial water, Industries, Water pollution, /ater pollution control, Water quality, Water uality control, Wastes, Systems analysis, Estimat-g, Management.

he substandard water quality of the nation's reams, lakes and estuaries presents a large de-and for waste water treatment facilities. Regional onsolidation of wastes and treatment in fewer and rger facilities is an advantageous method of meet-g this demand. Although some public assistance ay be expected, industry should examine availa-e alternatives for treating its wastes to minimize sts. To date, limited success has been achieved in rious attempts at regional consolidation. There-re, more effective methods of planning and im-ementing the required facilities are necessary. To valuate technical feasibility, waste streams should e catagorized as to treatment processes and en-ronmental effects. The economic cost of feasible sposal modes should be determined and evalu-ed for environmental impact. Two approaches ist for advancing understanding of regional water uality control systems: (1) systems planning stu-es, and (2) technology studies. Since technology udies ignore systems interaction, the systems anning approach should be given priority. Once asibility is shown, systems planning studies would llow. Technology studies should also be utilized narrowly-defined areas. (Hart-Florida)
/71-09210

ITY OF FRANKFORT V SLIPHER (MU-ICIPAL SEWAGE DISPOSAL).
62 NE 241-247 (App Ct Ind 1928).

escriptors: *Indiana, *Municipal wastes, *Sewage isposal, *Treatment facilities, Riparian rights, Public health, Natural streams, Treatment, Pollutants, Sewers, Sewage effluents, Judicial decisions, Damages, Wastes, Waste treatment, Waste disposal, Legal aspects.

Plaintiff riparian owner sued defendant city for damages resulting from defendant's upstream discharge of untreated sewage into a natural stream bordering plaintiff's farm. On appeal from a judgment for plaintiff, defendant contended that: (1) a municipality may lawfully discharge untreated sewage into a stream which is a natural outlet, providing the discharge is not negligent, and (2) it's actions did not constitute a public nuisance. In affirming, the Appellate Court of Indiana held that defendant was negligent in failing to utilize available technology to construct a sewage treatment facility. The court reasoned that, although defendant was authorized by statute to build and maintain sewers, public necessity did not require the discharge of untreated sewage which could have been purified at a reasonable cost. (Madsen-Florida)
W71-09218

MITCHELL REALTY CO V CITY OF WEST ALLIS (EXTENT OF DAMAGES CAUSED BY CITY'S POLLUTION OF STREAM).
206 NW 193-195 (Wis 1925).

Descriptors: *Wisconsin, *Water pollution, *Water pollution sources, *Damages, Streams, Sewage, Overflow, Land, Land tenure, Effluents, Sewage effluents, Sewers, Outlets, Industrial wastes, Judicial decisions, Legal aspects, Cities, Adjudication procedure.

Plaintiff landowner sought to recover damages for injury to his property caused by defendant city's pollution of a stream which overflowed plaintiff's land and decreased its agricultural value. Originally, plaintiff had brought suit against defendant and a private corporation which also contributed to the pollution. Plaintiff had received judgment but the Supreme Court of Wisconsin reversed on grounds not relevant to the present appeal. At the second trial damages were computed principally by referring to the testimony given in the first trial. Defendant appealed, contending that the trial court had failed to require plaintiff to establish within a reasonable certainty the damage caused by defendant and that a new determination was required as to the extent of damage caused by defendant. The Supreme Court of Wisconsin affirmed, holding that the evidence at the prior trial was sufficient to show the proportion of damage caused by defendant city. (Duss-Florida)
W71-09231

WAGNER V TOWN OF CONOVER (CITY'S LIABILITY FOR DISCHARGE OF SEWAGE INTO STREAM).
156 SE 167-169 (NC 1930).

Descriptors: *North Carolina, *Cities, *Water pollution, *Sewage, Water pollution effects, Water pollution control, Water pollution sources, Sewerage, Pollutants, Water law, Discharge (Water), Adjudication procedure, Judicial decisions, Legal aspects, Springs, Swimming pools, Streams, Riparian rights.

Plaintiff landowner sued defendant municipality for damages resulting from the discharge of city sewage into a stream which ultimately flowed through plaintiff's land. Plaintiff showed that a spring in the stream bank disappeared after defendant began discharging sewage, and that the stream water was used for a swimming pool. This evidence was held competant. Defendant asserted that the lower court's charge to the jury with respect to injury to health from maintainance of sewerage flow was prejudicial. The North Carolina Supreme Court held that, since no evidence or contention of injury to health was presented, the charge did not harm defendant. Defendant further contended that the lower court's charge that, if permanent damages were awarded, defendant would have an easement to continue discharge was reversible error. Nevertheless, the lower court's charge was upheld. The court observed that plaintiff had a right to have the issue of permanent damages presented to the jury. The lower court's decision for plaintiff was affirmed. (Hart-Florida)
W71-09233

CITY OF BARNESVILLE V PARHAM (CITY'S LIABILITY FOR DISCHARGING SEWAGE INTO OPEN STREAM).
160 SE 879-880 (Ga Ct App 1931).

Descriptors: *Georgia, *Cities, *Sewage, *Damages, Rent, Streams, Water pollution, Odor, Water pollution effects, Legal aspects, Judicial decisions, Adjudication procedure.

Plaintiff dairy farmer sued defendant city for damages from the discharge of sewage into a stream running through plaintiff's land. The sewage caused obnoxious odors on plaintiff's land. Plaintiff sought damages for the impaired rental value of his land. The Georgia Court of Appeals stated that plantiff might recover damages for the impaired rental value, and that the measure of damages was the diminution in rental value attributable to the injury. Furthermore, plaintiff's allegations that he lost profits from his dairy operation were upheld as equivalent to rental value for determining damages. However, the lower court's failure to instruct the jury on the proper measure of damages was held reversible error. (Hart-Florida)
W71-09244

SANITARY DIST OF CHICAGO V CHICAG PACKING CO (DISCHARGE OF STOCKYARD WASTE INTO SEWAGE CHANNEL).
241 Ill App 288-314 (1926).

Descriptors: *Illinois, *Sewage, *Channels, *Waste disposal, Cities, Administrative agencies, Waste treatment, Sewage treatment, Lake Michigan, Rivers, Water pollution control, Waste dilution, Waste assimilative capacity, Solid wastes, Municipal wastes, Legal aspects, Judicial decisions, Legislation.

Plaintiff sanitary district sought to enjoin defendant packing company from discharging trade wastes into plaintiff's sanitary channel. Plaintiff was organized to construct a channel to divert Chicago's municipal sewage into the Des Plaines River, away from Chicago's Lake Michigan water supply. Plaintiff contended the legislation did not contemplate discharge of solid trade wastes into the channel along with sewage and that defendant's trade wastes were not diluted or oxidized by the water, therefore creating a malodorous nuisance. Defendant contended that plaintiff was required by the applicable legislation to accept their trade wastes. The Illinois Appellate Court found that the legislation stated that before sewage was discharged, all garbage, dead animals, and parts thereof should be taken therefrom. Accordingly, it held that defendants could not discharge their wastes into the channel. Defendant's contention that plaintiff had no jurisdiction over Chicago's sewers and could not object that defendant discharged trade wastes into them was rejected. (Hart-Florida)
W71-09245

AN ANALYSIS OF ALTERNATIVE INSTITUTIONAL ARRANGEMENTS FOR IMPLEMENTING AN INTEGRATED WATER SUPPLY AND WASTE MANAGEMENT PROGRAM IN THE WASHINGTON METROPOLITAN AREA,
Institute for Defense Analyses, Arlington, Va. International and Social Studies Div.
Paul S. Hughes.
Available from the National Technical Information Service as PB-198 012, $3.00 in paper copy, $0.95 in microfiche. Institute for Defense Analyses Paper P-714, Mar 1971. 103 p.

Descriptors: *Water supply, *Waste treatment, *Institutional constraints, *Urban sociology, Waste disposal, Waste water disposal, Water reuse, Mathematical models, Sewage treatment, Solid wastes, Maryland, District of Columbia.
Identifiers: Water reclamation, Management engineering, Maryland, *Solid waste management, Washington metropolitan area, Potomac River basin.

The purpose of this paper is to consider what type of institutional machanism would be most appropriate for implementing an integrated water supply and waste management program in the Washington metropolitan area. Such a program is defined as one which contains comprehensive planning responsibilities cutting across many services, but which provides wholesale operating capability in the areas of water supply, waste water treatment, and solid waste management.
W71-09260

C N O AND T P RY CO V MOON (DUTY OF RAILROAD TO MAINTAIN DRAINAGE DITCH).

2 Tenn App 477-482 (1926).

Descriptors: *Tennessee, *Railroads, *Ditches, *Surface drainage, Right-of-way, Easements, Surface runoff, Drainage water, Overland flow, Rain water, Culverts, Drains, Drainage effects, Boundaries (Property), Prescriptive rights, Natural flow doctrine, Obstruction to flow, Judicial decisions, Legal aspects.

Plaintiff landowner sued defendant railroad for damages caused by the overflow of a drainage ditch along the railroad right-of-way. Plaintiff contended that the railroad had negligently allowed the ditch to become filled up, thus causing drainage water to back up and damage plaintiff's land. Defendant contended that, due to maintenance of the drainage ditch for more than twenty years, it had acquired rights by prescription. Defendant also contended that plaintiff had title to the drainage ditch and the duty to keep it open. In affirming a verdict and judgment for plaintiff, the Tennessee Appeals Court, Eastern Section, noted that the ditch along the right-of-way had been dug by the defendant for the purpose of providing and protecting the natural drainage of plaintiff's land. It is the duty of a railroad to provide ditches for the natural drainage of land along its right-of-way. Plaintiff therefore had no duty to go onto the right-of-way and clear the ditch. The railroad, in previously keeping the ditch open, thereby recognized plaintiff's right to have his surface drainage free from obstruction, and could claim no rights by prescription. (Smiljanich-Florida)
W71-09263

SCHLESSINGER V ROSENHEIM (LIABILITY OF TENANT FOR DRAINAGE OF RAIN WATER FROM ROOF ONTO NEIGHBORING BUILDING).
2 Tenn App 529-535 (1926).

Descriptors: *Tennessee, *Roofs, *Rain water, *Drainage, Drainage effects, Surface drainage, Repulsion (Legal aspects), Land tenure, Drainage water, Remedies, Damages, Leases, Buildings, Rainfall, Runoff, Drainage practices, Judicial decisions, Legal aspects.

Plaintiff store owner sued defendants, a landlord and a tenant, for an injunction and for damages caused by water being dumped onto plaintiff's roof from an adjoining building. Plaintiff contended that rainwater was drained from defendant's roof by a downspout onto plaintiff's roof, thereby damaging his store. Defendant landlord contended that the tenant was solely responsible for any damage. Defendant tenant contended that he had not constructed the spout and was under no duty to remove it, and that the water from his roof had wrongfully been drained onto his building from another building. In affirming a lower court judgment for plaintiff, the Tennessee Appeals Court, Eastern Section, noted that the tenant, not the landlord, was under a duty to keep the building in repair. Upon being notified it became the tenant's duty to remove the downspout, which was under his control and which he had no legal right to maintain. The fact that the water was being diverted onto the tenant's roof by another did not justify his diversion of the water onto plaintiff's roof. (Smiljanich-Florida)
W71-09267

SUMNER V O'DELL (INJUNCTION TO PREVENT POLLUTION OF SPRING WATER BY CATTLE).
12 Tenn App 496-500 (1930).

Descriptors: *Tennessee, *Water pollution, *Streams, *Reasonable use, Cattle, Domestic water, Riparian rights, Water quality, Spring waters, Springs, Legal aspects, Judicial decisions, Water pollution sources, Remedies, Relative rights.

Plaintiff lower riparian landowner sought to enjoin defendant upper riparian landowner from polluting the stream bordering their property. Plaintiff's and defendant's tracts were previously owned by one person, who conveyed plaintiff's tract first, along with the right to use the spring water flowing from defendant's tract. When defendant purchased the upper tract, he began using the lot through which the stream flowed as a confinement for cattle. The cattle polluted the water so that it was unfit for plaintiff's domestic uses. Apparently defendant's actions were purposeful, and with some malice, since the evidence presented clearly showed that defendant could have erected his fences to prevent pollution of the spring water. The Tennessee Court of Appeals held that defendant was utilizing his property unreasonably with respect to plaintiff's rights, and enjoined use of the lot as a cow pasture and path. (Hart-Florida)
W71-09333

LEGAL ASPECTS OF WATER USE AND CONTROL IN SOUTH CAROLINA. PART A -- LEGAL CONSIDERATIONS RELATING TO A NEW WATER RESOURCES LAW FOR SOUTH CAROLINA,
Clemson Univ., S.C. Water Resources Research Inst.
Charles H. Randall, Jr.
Available from the National Technical Information Service as PB-200 654, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Institute, Clemson University, Clemson, SC, Report No 20, Mar 1971. 68 p. OWRR Project B-003-SC (2).

Descriptors: *South Carolina, *Water resources, *Environmental effects, *Water policy, *Permits, Legal aspects, Legislation, Administrative agencies, Regulation, Water pollution, Judicial decisions, Rivers and Harbors Act, Land use, State governments, Coordination, Riparian rights.

Increasing and competing demands for water use have persuaded legislatures in many riparian states to enact statutes modifying traditional riparian rules. Some of these statutes incorporate elements of the appropriation system, and delegate to administrative agencies power to grant permits for water use. Other delegate to agencies power to declare emergency water areas, and to regulate withdrawals from such areas. Within recent years, increased concern for protection of the environment has led to statutes both Federal and State providing for inventory of water and related resources, large scale planning for water use and control, including water zoning, and extensive reorganization of administrative agencies to deal with these problems. South Carolina is experiencing population growth and industrial development, and is beginning to face some of the problems these statutes were designed to meet. These statutory developments are examined, with a view to their consideration by the administrative agencies and the General Assembly of South Carolina. Problems of State constitutional law relating to water use and control are also examined. (See also W71-09364)
W71-09363

LEGAL ASPECTS OF WATER USE AND CONTROL IN SOUTH CAROLINA. PART B -- SOUTH CAROLINA LAKES AND PONDS: A STUDY OF PUBLIC AND PRIVATE RIGHTS THEREIN,
Clemson Univ., S.C. Water Resources Research Inst.
David H. Means.
Available from the National Technical Information Service as PB-200 655, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Institute, Clemson University, Clemson, SC, Report No 21, Mar 1971. 45 p, append. OWRR Project B-003-SC (3).

Descriptors: *Lakes, *Legal aspects, *Vanigable waters, *Riparian rights, *Water law, Nonnavigable waters, Ownership of beds, Public rights, Recreation, Reservoirs, Water pollution.

The growing importance of South Carolina's lakes for commercial and recreational uses necessitates increased emphasis on a water resources policy. Accordingly, the law of lakes was surveyed insofar as such law may be applicable to the formulation of an overall regulatory scheme. In general the law classifies water as navigable or nonnavigable. In navigable waters the interest of the federal government is paramount, followed by that of the state, with the public interest prevailing over that of persons with private interests resulting from the ownership of land adjacent to the water. Where the water in question is nonnavigable the public as such has no interest therein, and the exclusive right to the enjoyment of such water, subject to the police power of the state, is in the riparian landowners, that is, those persons who own a portion of the bed of the nonnavigable water. In the regulation of competing interests in the use of water, the legal tools available include those of eminent domain and of statutes; the riparian system; and the use of restrictive covenants. (See also W71-09363)
W71-09364

SHELTON V MOSIER (PRESCRIPTIVE RIGHT OF MILL DAM OWNER TO OVERFLOW UPPER STREAM).
19 Ohio App 89-94 (1924).

Descriptors: *Ohio, *Mill dams, *Overflow, *Prescriptive rights, Dams, Floods, Backwater, Streams, Riparian land, Land tenure, Easements, Riparian rights, Competing uses, Obstruction to flow, Reasonable use, Natural flow doctrine, Relative rights, Riparian waters, Submergence, Judicial decisions, Legal aspects.

Plaintiff upper landowner sued defendant lower landowner for damages resulting from the overflow of a stream caused by defendant's mill dam. Plaintiff contended that water backed up by the dam damaged his crops and land. Defendant contended that the dam had been maintained in the same condition and height for more than twenty-one years and that defendant had therefore obtained a prescriptive right to dam the stream and cause its overflow. In reversing a lower court verdict and judgment for defendant, the Court of Appeals for Gallia County, Ohio, noted that defendant had not shown that the dam had been affecting the overflowed lands to the same degree for more than twenty-one years. When a right to overflow upper lands rest in prescription only, its extent is measured by the actual enjoyment of the easement, and not by the height of the dam maintained during that period. As defendant had failed to allege habitual or usual overflow during the period of prescription, his defense was inadequate, and the crucial question in the case had not been tried. (Smiljanich-Florida)
W71-09369

/ELLS V SHEETS (CITY'S LIABILITY FOR ANDOWNERS POLLUTING DITCH NOT ART OF THE CITY'S DRAINAGE SYSTEM).
13 Ky 438, 281 SW 159-162 (Ct App Ky 1926).

escriptors: *Kentucky, *Water pollution, *Cities, Drainage, Water pollution sources, Water pollu-on effects, Water quality, Ditches, Damages, egal aspects, Sewers, Drainage systems, Judicial ecisions.

laintiff landowner sued defendant city and defen-nt landowners to recover damages for pollution a natural drainage ditch flowing through plain-ff's lot. The ditch flowed along the rear of defen-nt landowners' lots, and they discharged their wage, garbage, and other refuse into it. The pol-ted water lay stagnant in the ditch on plaintiff's t, and created offensive odors and a breeding ace for mosquitoes. At trial, the complaint ainst defendant city was dismissed. On appeal, e remaining defendants contended that the city as jointly liable. The complaint contended that e landowners used the drain with the city's per-ission. The Court of Appeals of Kentucky held at the city could not be liable unless the drain ere part of its sewage system, and noted that the ty could not give permission to use the ditch un-ss it were part of the sewage system. Since the city ad not formally adopted the ditch as part of its wer system, the court upheld the lower court's smissal. Furthermore, the court held that the vidence supported the lower court's denial of de-ndant landowners notion for a directed verdict. Hart-Florida)
/71-09371

ISH-TOXICITY PROBLEMS OF PESTICIDES N JAPAN - THE PRESENT SITUATION AND HE POLICIES OF THE MINISTRY OF GRICULTURE AND FORESTRY,
gricultural Chemical Inspection Station, Tokyo Japan).
or primary bibliographic entry see Field 05A.
/71-09377

EAVER DAM COAL CO V DANIEL (POLLU-ION DAMAGE TO AGRICULTURAL LAND).

27 Ky 423, 13 SW2d 254-257 (1929).

escriptors: *Kentucky, *Riparian rights, *Mine astes, *Water pollution effects, Legal aspects, Ju-icial decisions, Remedies, Damages, Pollutants, lining, Mine drainage, Coal mines, Industrial astes, Water pollution sources, Path of pollutants, lood damage, Impaired water quality, Riparian aters, Waste disposal, Pollutant identification.

laintiff riparian owner obtained judgment against efendant coal mining company for damages to laintiff's land. Plaintiff alleged that a watercourse raining his land was polluted upstream by cop-eras and copperas water escaping from defen-ant's mine, and that when the watercourse over-owed, copperas was deposited on plaintiff's land, ecreasing its fertility. On appeal, defendant con-nded: (1) that it was absolved by an 'act of God', n unprecedented rain which caused the flood; (2) hat plaintiff could not recover because there was o negligence shown on defendant's part; and (3) hat defendant was liable only for one third of the amage to plaintiff's land, since the evidence howed that two thirds of the copperas water came rom mines other than defendant's. The Court of Appeals of Kentucky held that an 'act of God' would be a defense only if it were the proximate nd sole cause of the injury, and that it would as-ume that the jury assessed only the proportion of lamages shown by the evidence to have been aused by defendant's mine. The court also held hat plaintiff, as a riparian owner, need not show egligence, but only invasion of his rights by defen-lant. (Madsen-Florida)
W71-09380

CONESTEE MILLS V CITY OF GREENVILLE (CITY'S LIABILITY TO LOWER RIPARIAN OWNER FOR SEWAGE DISCHARGE).
158 SE 113-120 (SC 1931).

Descriptors: *South Carolina, *Water pollution, *Cities, *Sewage, Water pollution effects, Water pollution control, Water pollution sources, Pollution abatement, Pollutants, Odor, Legal aspects, Judicial decisions, Prescriptive rights, Rivers, Riparian rights, Discharge (Water).

Plaintiff lower riparian owner sued defendant city to recover damage from water pollution. Defendant was discharging sewage into the river adjacent to plaintiff's property in 1892, pursuant to legislation. The discharges resulted in fishkill, offensive odors, and contamination. Twenty years had elapsed before plaintiff sued, and defendant asserted a prescriptive right to continue the discharges. The pollution was characterized as a continuing nuisance, however, and no actionable injury had arisen previously; hence the South Carolina Supreme Court held that defendant had not acquired a prescriptive right to pollute. Defendant furthermore asserted that plaintiff purchased subject to the pollution. Since the pollution could be abated, the discharges were not characterized as an inverse condemnation and the court rejected the contention. The court also held that the statute of limitations did not bar actions for injuries occuring in the six years prior to suit. Accordingly, the lower court's decision in favor of defendant was reversed. (Hart-Florida)
W71-09383

BUCKLES V CITY OF DECATUR (LIABILITY OF CITY FOR POLLUTION OF RIVER).
234 Ill App 89-97 (1924).

Descriptors: *Illinois, *Water pollution, *Livestock, *Stock water, Water pollution effects, Water pollution sources, Cities, Sewage, Water quality, Potable water, Diseases, Mortality, Riparian rights, Natural flow doctrine, Pollutants, Waste disposal, Color, Odor, Fishkill, Toxicity, Taste, Farms, Judicial decisions, Legal aspects.

Plaintiff riparian landowner sued defendant municipality to recover damages for injury to livestock resulting from pollution of the river running along plaintiff's land. Defendant discharged its sewage into the river, and plaintiff's stock became ill, some dying, from drinking the polluted water. At trial, the jury found defendant not liable, and plaintiff appealed when his motion for a new trial was denied. The Illinois Appellate Court stated that a riparian owner has a right to the natural flow of the stream, and that one causing pollution was liable in damages. The court furthermore observed that a city was liable as any private person would be and that liability was unaffected by the size of the city. Following an extensive review of the evidence presented at trial, the court determined that defendant's evidence failed to refute the evidence presented by plaintiff. Accordingly, the court held that the verdict was contrary to the weight of the evidence and reversed and remanded for a new trial. (Hart-Florida)
W71-09386

POLICY AND PLANNING FOR RECREATIONAL USE OF INLAND WATERS,
Connecticut Univ., West Hartford. School of Law.
Robert I. Reis.
Temple Law Quartely, Vol 40, No 2, p 155-193, Winter 1967. 82 references. OWRR Project A-012-CONN (1).

Descriptors: *Recreation, Legal aspects, Economics, Water law.
Identifiers: *Connecticut, Normanoch Association, Lewis and Clark, Ohio, Oregon, New England.

This article discusses the conflict between private ownership of lakes and public need of open waters for recreational uses. The author describes the philosophical and economic implications of judicial control over private ownership of lake facilities. He concludes that states should develop long range plans for recreational development and make plans for the acquisition of private lakes for the public. (Holmes-Rutgers)
W71-09391

CHRISTIE V SANITARY DISTRICT OF CHICAGO (LIABILITY FOR EXCESSIVE DISCHARGE OF WATER).

256 Ill App 63-110 (1930).

Descriptors: *Illinois, *Sewage, *Flooding, *Electric power production, Cities, Waste dilution, Public health, Dams, Levees, Adjudication procedure, Legal aspects, Judicial decisions, Sewage treatment, Rivers, Lake Michigan, Flood damage, Canals, Design flow, Discharge (Water), Lakes.

Plaintiff riparian landowner sued defendant sanitary district for damages resulting from excessive discharge of water into the Illinois River. Defendant discharged water from Lake Michigan into a channel to dilute the sewage from Chicago, which flowed into the river. The authorized quantity of water was in direct ratio to Chicago's population. Plaintiff charged that defendant: (1) discharged more than the suthorized quantity; (2) the flowage was not continuous; and (3) discharged additional water to generate electricity. As a result, defendant's lands were flooded. The Illinois Appellate Court determined, however, that plaintiff's assertions ultimately reduced to a charge that defendant had increased the flow to an excessive amount. Defendant's activities had commenced in 1903, but plaintiff did not sue until 1923. The statute of limitations was five years. Since plaintiff was unable to show that defendant had increased the flow in the preceding five year period the court held that the lower court should have directed verdict for defendant. The court held that plaintiff's cause accrued when the increased flow reached the levels of 1904 and 1913. Furthermore, the court found that defendant did not injure plaintiff by construction of use of the channel. (Hart-Florida)
W71-09395

ANDREWS V VILLAGE OF GEORGETOWN (RESPONSIBILITY OF MUNICIPAL CORPORATION TO PREVENT FLOODS CAUSED BY STREET CONSTRUCTION).
34 Ohio App 79, 170 NE 450-451 (1929).

Descriptors: *Ohio, *Surface drainage, *Surface runoff, *Road construction, Road design, Roads, Surface water, Judicial decisions, Damages, Legal aspects, Floods, Flood damage, Real property, Cities.

Plaintiff landowner sought injunctive relief and incidental damages against defendant municipal corporation for surface water damage to plaintiff's residence, located within defendant's corporate limits. Flooding of plaintiff's property undisputedly resulted from reconstruction of a street abutting plaintiff's property. Defendant contended that, since the gravamen of plaintiff's case was that the reconstructed road was too high to permit drainage of surface water, defendant was not liable because the grade was fixed, the work sone, and the cost of the reconstruction paid by the state. The Court of Appeals of Ohio held that municipal corporations were responsible, under an Ohio statute, for keeping streets within their corporate limits free from nuisance, and thus affirmed the granting of an injunction against defendant. Since it appeard to the court that repairs already made by defendant would elimate future floods of plaintiff's property, the court assessed damages only for prior losses, and not for the reduction in value of plaintiff's property subject to the hazards of flood. (Madsen-Florida)
W71-09396

ANGLIM V CITY OF BROCKTON (MUNICIPAL LIABILITY FOR PROPERTY DAMAGES DUE TO RIVER OVERFLOW).
179 NE 289-294 (Mass 1932).

Descriptors: *Massachusetts, *Cities, *Drainage systems, *Flood damage, Stream improvement, Non-navigable waters, Streams, Dredging, Channel improvement, Stream stabilization, Surface drainage, Drainage effects, Damages, Riparian rights, Storm runoff, Sewage, Sewage disposal, Legislation, Statutes, Legal aspects, Judicial decisions.

A statute authorized defendant city to improve surface drainage by improving the flow of streams within the city limits. Defendant, acting through its highway commissioners,who were public officers, employed an independent contractor to widen, deepen, and straighten natural streams. Plaintiff landowner sought: (1) to restrain defendant from discharging refuse and sewage into a nonnavigable stream that flowed over his property nad (2) damages resulting from a runoff of sewage beyond the stream's channel during an unusual freshet. The Supreme Judicial Court of Massachusetts denied relief, holding that: (1) in the absence of a statute defendant would not be liable for the negligence of the commissioners performing public duties; (2) defendant was not liable when public officers diverted water from streets into a stream that overflowed plaintiff's property; (3) plaintiff's exclusive remedy for injury resulting from materials deposited upon his land was that specified in the statute and not a bill in equity; and (4) as to the sewage, it was deposited as a result of unusual weather and not from defendant's negligent construction or use of the sewers. (Rees-Florida)
W71-09397

COMPREHENSIVE WATER RESOURCES MANAGEMENT - THE PAST AND THE FUTURE,
Department of the Interior, Washington, D.C.
A. Gordon Everett.
Water Resources Bulletin, Vol 7, No 1, p 185-188, Feb 1971.

Descriptors: *Water resources development, *Institutional constraints, *Project planning, *Decision making, Administration.
Identifiers: Colorado River Basin, Water Resources Planning Act of 1965, Water Resources Council, Environmental Protection Agency.

American water problems have historically been characterized by the artificial separation of water quality and water quantity, and ignoring water economics. Our water affluence has allowed us to misuse them. Many agencies are affilitated with water resources management, yet only two have significant programs dealing with both quality and quantity. The whole system is poorly organized for all agencies depend on others in accomplishing their missions. (Campbell-Rutgers)
W71-09398

TURNER V PIERSON-HOLLOWELL WALNUT CO (OWNERSHIP OF LAND TO THREAD OF STREAM).

260 Ill App 158-166 (1931).

Descriptors: *Illinois, *Boundary disputes, *Ownership of beds, *Non-navigable waters, Legal aspects, Judicial decisions, Boundaries (Property), Rivers, Beds under water, River beds, Beds, Freshwater, Bodies of water, Trees, Land, Real property.

Plaintiffs and their children owned a tract of land which was bordered on one side by a non-navigable river. Plaintiffs brought an action in replevin to recover six walnut logs which were taken by defendant from a large tree that had been lying in the bed of the river. The tree had lain with its large end about three feet from the land allegedly owned by plaintiffs and with the trunk in the river. The Appellate Court of Illinois held that unless the deed clearly specified otherwise, a deed of land bordered by a river also carried with it the title of the grantor in the bed of the river to the center thread of the current and that the boundary would vary as the main channel changed. Plaintiffs' deeds did not mention what portion of the river was the boundary line. The court found that there was sufficient evidence to support the finding of the trial court that plaintiffs did own the land on which the tree was taken and were hence entitled to replevy the logs. (Johnson-Florida)
W71-09399

TENNESSEE ELECTRIC POWER CO V DODSON (OBSTRUCTION OF GROUNDWATER FLOW).
14 Tenn App 54-62 (1931).

Descriptors: *Tennessee, *Percolating waters, *Surface-groundwater relationships, *Underground streams, Groundwater, Fresh water, Groundwater movement, Sinks, Groundwater barriers, Springs, Legal aspects, Judicial decisions, Streams, Floods, Streamflow, Water injury, Dams, Backwater, Subsurface runoff.

A stream flowed across plaintiff's land and emptied into several sinkholes. It was not known where the subterranean passages from the sinkholes lay, but the water had been traced to four springs. Two of the springs were below the level of the pool created by defendant power company's dam, while two were above the pool level. Plaintiff sued to recover for damages to his land which occurred when the discharge of water from the sinkholes was obstructed and the stream backed up and flooded his land. Plaintiff alleged that defendant's dam had caused the obstruction by blocking the normal flow of the water which left the sinkholes. The Tennessee Court of Appeals reversed a judgment for plaintiff. The presumption is that groundwater is percolating. Proof is required to show that the water flows in a well defined stream before the groundwater will be considered to be an underground stream. If water does flow in an underwater stream, the lower owner has no right to obstruct the flow so that it floods the lands of the upper owners. The court held that plaintiff had failed to show that the water flowed in an underground stream or that defendant had caused the flooding. (Johnson-Florida)
W71-09400

COMPREHENSIVE PLANNING IN THE SOUTHEAST,
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-09418

STATE ORGANIZATIONS FOR WATER RESOURCES PLANNING,
Utah State Univ., Logan. Dept. of Civil Engineering.
Daniel H. Hoggan.
Journal American Water Works Association, Vol 60, No 7, p 667-674, July 1968. 1 ref.

Descriptors: *Water resources development, *Planning, State governments.
Identifiers: US Water Resource Council, California Water Commission, New York Water Resources Commission, Minnesota, New York, Texas, Utah.

Most of the states in the United States have fine planning units but lack the management of the implementation of planning, the staffs tend to become understaffed and under funded. Thus, the integration of the various plans is hampered or lost. The piece shows two separate alternative solutions, a single state resources agency or a central group of heads of agencies for coordination. (Campbell-Rutgers)
W71-09425

WATER RIGHTS PROBLEMS IN THE UPPER RIO GRANDE WATERSHED AND ADJOINING AREAS,
Arizona Univ., Tucson. Coll. of Law.
Robert Emmet Clark.
Natural Resources Journal, Vol 11, No 1, p 48-68, Jan 1971. 97 ref.

Descriptors: *Water law, *Public rights, *Water supply, *Political aspects, Water resources development, Project planning.
Identifiers: Reclamation Law of 1902.

The author describes the history of land and water rights in Southwestern United States with primary emphasis on New Mexico. He explains that under Mexican and Spanish law water rights were not included in land grants, a fact which has led to a great deal of confusion in modern times. Also discussed are the special problems of public ownership and Indian reservation use of water supplies. (Holmes-Rutgers)
W71-09426

PATTERNS OF POLITICS IN WATER RESOURCES DEVELOPMENT,
National Water Commission, Arlington, Va.
Helen Ingram.
Natural Resources Journal, Vol 11, No 1, p 102-118, Jan 1971. 28 ref.

Descriptors: *Water resources development, Cost-benefit analysis, Political aspects.
Identifiers: *Central Arizona Project, Colorado River Basin Bill, Water Resources Council.

The author describes the present patterns that are used in adopting new water development projects in the United States. Even though cost-benefit analysis is used, it is easily twisted to gain support for one viewpoint, so that no overall discussion of who will benefit from the project is undertaken. A system of local pressure politics has emerged as the present pattern. (Holmes-Rutgers)
W71-09427

PHOSPHATES IN DETERGENTS AND THE EUTROPHICATION OF AMERICA'S WATERS.
For primary bibliographic entry see Field 05C.
W71-09429

PHOSPHATES IN DETERGENTS AND THE EUTROPHICATION OF AMERICA'S WATERS.
For primary bibliographic entry see Field 05C.
W71-09430

CONFERENCE REPORT ON HR 4148, WATER QUALITY IMPROVEMENT ACT OF 1970.

116 Cong Rec 2464 thru 2473 (daily ed Mar 25, 1970). 9 p.

Descriptors: *Water quality, *Water pollution sources, *Water pollution control, *Pollution abatement, Governments, Federal government, Legislation, Government finance, Permits, Administration, Abatement, Water pollution, Pollutants, Oil wastes, Industrial wastes, Chemical wastes, Environmental sanitation, Water pollution treatment, Waste water (Pollution), Acid mine water, Legal aspects.

According to this excerpt from the Congressional Record favorable comments were made by several representatives concerning the Water Quality Improvement Act of 1970. The conference report was accepted by a vote of 358 yeas, 0 nays, and 72 not voting. The conference report on the Act discussed: (1) the control of oil pollution, (2) cleanup authority, (3) limits of liability for oil spilled from vessels shipping oil, (4) limits of liability for on-shore and off-shore oil installations, (5) license requirements for use of the nation's waters, (6) a requirement for reasonable assurances that use of waters will not violate water pollution stan-

ards, (7) acid mine drainage research, (8) pollu-on control in the Great Lakes, (9) land acquisi-ons for field laboratories to study pollution, (10) il pollution removal research, (11) extension of ie basic existing research authorization, (12) evelopment of knowledge on the effects of pesti-des, and (13) a training program to provide ained personnel to operate sanitary facilities. oncern was expressed by certain House members the following areas: (1) possibility of delay due the complex system, (2) the meaning of the term easonable assurances', (3) whether the Act would pply to wholly intra-state water, and (4) cost of e Act. (Robinson-Florida)
71-09431

INANCIAL RESPONSIBILITY FOR OIL POL-UTION CLEANUP.
ederal Maritime Commission, Washington, D.C.

ederal Register, Vol 36, No 35, p 3263-3264 (Feb), 1971). 2 p.

escriptors: *Water pollution control, *Oily water, Damages, *Administrative decisions, Legislation, egulation, Ships, Cleaning, Federal government, dministrative agencies, Legal aspects, Federal ju-sdiction, Oil wastes, Oil, Pollution abatement, dministration, Pollutants, Water pollution, Water olicy, Water quality, Water quality control.

ursuant to section 4 of the Administrative rocedure Act and sections 11 (p) (1), 11 (p) (2), nd 11 (p) (3) of the Federal Water Pollution Con-ol Act, as amended by the Water Quality Im-rovement Act of 1970, General Order 27 of the ederal Maritime Commission, dealing with finan-al responsibility for oil pollution cleanup, is erein amended. The essence of the amendment is at language is added to certification forms in-cating that insurers shall be entitled to invoke all ghts and defenses. Parties who have already sub-itted Certificate of Insurance Forms, Surety Bond orms, and Guarantee Forms may submit a sub-itute form with the clarifying language. The use of ese forms, with or without the new language, will e acceptable to the Commission as evidence of nancial responsibility. These amendments do not bstantially change any existing requirements but e merely for the purpose of clarifying the Com-ission's intent and aligning the language of the le more closely with the language of the enabling atute. (Robinson-Florida)
71-09432

N ACT IN RELATION TO WATER SUPPLY, RAINAGE, SEWAGE, POLLUTION, AND LOOD CONTROL IN CERTAIN COUNTIES.
ublic Act 76-2435, Illinois Legislative Service, p 58 (1970) amending Illinois Annotated Statutes 34, secs 3114, 3116.

escriptors: *Illinois, *Water pollution control, Local governments, *Administrative decisions, dministrative agencies, State governments, egislation, Water supply, Drainage, Sewage, ood control, Pollution abatement.

n Illinois statute concerning water supply, ainage, sewage, pollution, and flood control in rtain counties, is amended to provide that: (1) efore work is commenced under the Act, the ans shall be approved by the Environmental Pro-ction Agency and the Department of Public orks and Buildings; and (2) county boards shall ve authority to prevent and abate water pollu-on, although their authority in this respect does ot exceed that of the state Pollution Control oard. (Hart-Florida)
71-09433

ATER QUALITY STANDARDS (PROCEDURE OR REVISION).
nvironmental Protection Agency, Washington, C.

Federal Register, Vol 36, No 68, p 6762-6764 (Apr 8, 1971). 3 p.

Descriptors: *Water quality control, *Water pollution control, *Administrative decisions, *Conferences, Water quality, Water resources, Legal aspects, Federal government, State government, Administration, Administrative agencies, Regulation, Standards, Water pollution.
Identifiers: *Water Pollution Control Act.

Pursuant to the Federal Water Pollution Control Act the Administrator of the Environmental Protection Agency proposes new regulations concerning water quality standards. The Administrator or the governor of any state may seek to revise water quality standards. If the Administrator desires revisions he shall call a conference. If a governor wishes to revise water quality standards he shall request the Administrator to initiate a conference, and he shall submit the following: (1) a description of the location and nature of the interstate waters involved, standards to be revised, and the nature of the revision and reasons therefor; (2) a copy of the water quality standards with proposed deletions marked; (3) a summary of any public hearing held; and (4) an opinion by the State Attorney General that the proposed revisions have been adopted by the state if such is the case. The following areas relating to such a conference are detailed: (1) notice of conference; (2) service of notice; (3) parties; (4) organization and general procedures of the conference; (5) presentation of material; (6) conference procedure; (7) record of proceedings; and (8) preparation, publication, and promulgation of water quality standards. (Robinson-Florida)
W71-09434

SALINE WATER CONVERSION ACT OF 1971 (A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO CONTINUE RESEARCH AND DEVELOPMENT FOR THE TREATMENT OF SALINE AND OTHER CHEMICALLY CONTAMINATED WASTE WATER TO MAINTAIN OR IMPROVE THE QUALITY OF WATER).

Senate Bill 991, 92d Cong, 1st Sess (1971). 12 p.

Descriptors: *Desalination processes, *Waste water treatment, *Water quality control, *Desalination, Desalination plants, Water quality, Water sources, Water supply, Water resources, Water resources development, Water pollution, Water pollution treatment, Water purification, Water treatment, Byproducts, Desalination apparatus, Water reuse, Grants, Research and development, Federal government, State governments, Administration, Administrative agencies.

Under this proposed legislation the Secretary of the Interior would be authorized to: (1) conduct and promote research to develop processes for the conversion of saline water, (2) pursue opportunities arising during research, (3) conduct engineering and technical work, (4) study methods for the marketing of byproducts, and (5) undertake economic studies. The Secretary would also: (1) explore potential cooperative agreements with non-federal governmental entities, (2) recommend the earliest opportunity for the construction of desalting plants, (3) utilize the expertise of other federal agencies, and (4) accept financial or other assistance from any state or public agency. In carrying out his functions the Secretary may: (1) make grants to educational and scientific organizations; (2) acquire services of required types of personnel; (3) utilize federal laboratories; (4) establish necessary facilities; (5) acquire secret processes, technical data, inventions, patents, licenses, land and plants; (6) gather scientific literature; (7) conduct on-site inspections; (8) foster and participate in conferences; (9) coordinate, correlate, and publish information; and (10) cooperate with other federal departments, with state and local departments, and with interested persons. All research will be conducted so that the developments will be available to the general public. Nothing in this bill would alter existing law as to ownership and control of water. (Robinson-Florida)
W71-09435

A BILL TO REQUIRE THE SECRETARY OF THE ARMY, ACTING THROUGH THE CHIEF OF ENGINEERS, TO ENGAGE IN PUBLIC WORKS FOR THE PREVENTION AND CONTROL OF WATER POLLUTION.
Senate Bill 1009, 92d Cong, 1st Sess (1971). 2 p.

Descriptors: *Water pollution control, *Sanitary engineering, *Sewage treatment, *Waste water treatment, Water pollution, Pollution abatement, Pollutants, Federal government, Projects, Water pollution sources, Sewage, Wastes, Environmental sanitation, Sewage disposal, Storm runoff, Waste water disposal, Waste water (Pollution), Waste treatment, Water purification, Water treatment, Research and development, Construction, Dredging.

This proposed legislation would provide that the Secretary of the Army, acting through the Chief of Engineers, is authorized and directed to undertake, in the civil works program, projects for research, development, demonstration, and construction (including dredging) of works for the collection, purification, storage, and reuse of storm waters, sewage, and water-borne waste, for the purpose of preventing, abating, and controlling water pollution. Those projects shall have priority which reflect the most favorable ratio of environmental benefits to costs. Projects authorized by this bill would be subject to all the applicable provisions of law relating to flood-control projects, as determined by the Secretary of the Army. (Robinson-Florida)
W71-09436

CLEAN WATER COMMITMENT ACT OF 1971 (A BILL TO PROVIDE A NATIONAL COMMITMENT FOR FINANCING OF EXPANDED PROGRAMS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT, TO ASSURE BETTER COORDINATION IN DEVELOPMENT OF CLEAN WATER PROGRAMS).
Senate Bill 1143, 92d Cong, 1st Sess (1971). 7 p.

Descriptors: *Water pollution control, *Government finance, *Water quality, *Pollution abatement, Water pollution, Water quality control, Administrative agencies, Federal government, State governments, Legislation, Legal aspects, Grants.

To provide a national commitment of $15 billion for financing of expanded programs under the Federal Water Pollution Control Act and for better coordination in development of clean water programs, this bill entitled the Clean Water Commitment Act of 1971 is proposed. In state determinations of project priority, primary emphasis must be placed upon effectiveness of individual projects in abating water pollution and improving water quality. Limitations of federal grants under the program are: (1) projects must be approved by the state water pollution agency and the Secretary, and must be included in a comprehensive plan; (2) enforceable water quality standards must be established for affected waters; (3) grants are limited to 75% of project cost; (4) grantees must agree to pay the remaining cost; (5) efficient operation and maintenance must be assured; and (6) projects must conform to state water pollution control plans. Seventy-five per cent of available funds are allocated to the state on a population basis; the remainder are designated for abatement of the most severe water pollution problems. An annual reporting and accounting to Congress is required. (Hart-Florida)
W71-09437

A BILL TO REGULATE THE DISCHARGE OF WASTES IN TERRITORIAL AND INTERNATIONAL WATERS UNTIL FIVE YEARS AFTER

THE ENACTMENT OF THE ACT AND TO PROHIBIT SUCH DISCHARGE THEREAFTER.
Senate Bill 1082, 92d Cong, 1st Sess (1971). 8 p.

Descriptors: *Permits, *Oceans, *Research and development, Continental shelf, Technology, Grants, Administrative agencies, Federal government, Ships, Legal aspects, Government finance, Ecology, Environment, Water pollution, Water pollution control, Water quality, Water quality control, Marine animals, Marine plants, *Waste disposal, Regulation, Waste dumps, Wastes.

Five years from enactment of this proposed legislation, discharge of wastes into territorial or international waters would be prohibited. In the interim period, discharge would be permitted only under permit from the Administrator of the Environmental Protection Agency. Permits would only be issued when the Administrator determined that marine ecology would not be harmed by the discharge. Furthermore, no permits would be issued for discharging sites between the continental shelf and the United States coast, and the Administrator would have authority to bar discharge of any specific matter deemed deleterious to the marine environment. Ocean dumping sites could be designated by the Administrator. Violation would be punished by civil fine. Additionally, the Administrator would conduct research and demonstration projects to determine methods of using and disposing of wastes normally dumped at sea. Private agencies as well as state and local governments would be encouraged and assisted by the federal government in conducting similar projects. Federal grants would be available for these activities. (Hart-Florida)
W71-09438

ACID MINE DRAINAGE (INDUSTRY ATTEMPTS TO DESCRIBE AND SOLVE POLLUTION PROBLEMS).
For primary bibliographic entry see Field 05G.
W71-09439

WASTE DISPOSAL IN DEEP WELLS.
National Industrial Pollution Control Council, Washington, D.C.
For primary bibliographic entry see Field 05E.
W71-09440

1969 FISH KILLS CAUSED BY POLLUTION (STATISTICAL REPORT).
For primary bibliographic entry see Field 05B.
W71-09441

NUISANCE LAW AS AN ENVIRONMENTAL TOOL.
David G. Warren.
Wake Forest Law Review, Vol 7, No 2, p 211-229, 1971. 19 p, 110 ref.

Descriptors: *North Carolina, *Water pollution control, *Pollution abatement, *Public rights, Legal aspects, Water law, Water pollution, State governments, Local governments, Cities, Environment, Social aspects, Environmental sanitation, Public health, Water quality, Water quality control.

North Carolina recognizes actions of public and private nuisance. An historical background of nuisance law is provided. Forms of actions based on public nuisance, private nuisance, negligence, and tresspass are discussed and compared. Private and public remedies of damages, injunctive relief, and abatement by self-help are discussed. The effectiveness of nuisance as a tool of environmental control is examined with reference to the use of nuisance by municipalities, counties, and local boards of health. The author concludes that North Carolina's nuisance laws are uncertain and confused and feels that actions for public and private nuisance should be preserved by law, broadened in scope, clarified, and used more often. Nuisance has on occasion been successfully used for environmental control but may become ineffectual. The author, lists several possibilities: (1) return to common law approaches exclusively, (2) abolish all nuisance actions not based on specific laws, or (3) empower private citizens to bring nuisance actions on behalf of the state. The last possibility is favored. (Robinson-Florida)
W71-09442

RIVERS, LAKES, AND STREAMS--REGU LATION.
Public Act 76-2453, Illinois Legislative Service, p 579-581 (1970) amending Illinois Annotated Statutes ch 19, secs 61a, 65.

Descriptors: *Illinois, *Permits, *Lake Michigan, *Landfills, Legislation, Administration, Administrative decisions, Administrative agencies, Water pollution, Water pollution sources, Water pollution control, Water use, Water supply, Lakes, Streams, Rivers, Water quality, Water quality control, Pollution abatement, Legal aspects, Structures.

An Illinois statute concerning regulation of rivers, lakes, and streams is amended to provide for close cooperation between the Pollution Control Board, Environmental Protection Agency, Illinois Institute for Environmental Quality, and the Department of Public Works and Buildings, especially for preservation of Lake Michigan. The Environmental Protection Agency is directed to abate pollution of Lake Michigan and regularly conduct water quality surveys in it, making results available to all interested parties. Futhermor, the amendment makes landfills or construction in public waters unlawful absent a permit from the Department of Public Works and Buildings. Permits may not be issued for construction in Lake Michigan without concurrence by the Pollution Control Board. Violation of the statute is punishable by fine and imprisonment. Building of causeways, harbor, or mooring facilities in Lake Michigan must be approved by the legislature; structures erected in violation may be abated as purprestures. Permits may be granted by the Department of Public Works and Buildings for use of public water. Where a permit is sought for construction of land-fills in public waters, the Department shall require, as a condition precedent, approval by riparian owners affected by the structure. (Hart-Florida)
W71-09443

TAXATION-POLLUTION CONTROL FACILITIES.
Public Act 76-2451, Illinois Legislative Service, p 577-578 (1970) amending Illinois Annotated Statutes ch 120, sec 502a.

Descriptors: *Illinois, *Pollution abatement, *Taxes, *Administrative decisions, Administrative agencies, Air pollution, Water pollution, Water pollution control, Water quality, Water quality control, Legislation, Legal aspects, Treatment facilities.

The Illinois Revenue Act is amended to define 'pollution control facilities' as facilities operated for the primary purpose of controlling air or water pollution, as defined in the Environmental Protection Act, or for the primary purpose of treating substances which if released untreated would be deleterious to the environment. The Pollution Control Board shall certify pollution control facilities for tax purposes. Application for a pollution control facility certificate shall be filed with the Pollution Control Board, as required by its procedure, and the Board will issue a certificate to conforming facilities, which will receive preferred tax treatment for the period certified. Hearings must be provided before denial of certification. The Board may revoke certification on its own motion when: (1) fraud exists, (2) the certificate holder has substantially failed to proceed with operation of the facility, or (3) the facility has ceased to be used for pollution control. Written notice of the Board's action shall be furnished applicants. Any aggrieved applicant or holder may appeal pursuant to the Administrative Review Act. (Hart-Florida)
W71-09444

AN ACT IN REALTION TO PREVENTION AND ABATEMENT OF AIR, LAND AND WATER POLLUTION.
Public Act 76-2434, Illinois Legislative Service, p 557-558 (1970) amending Illinois Annotated Statutes ch 14, secs 11, 12.

Descriptors: *Illinois, *Pollution abatement, *Air pollution, *Water pollution, Legislation, Judicial decisions, Legal aspects, Water pollution control, Administrative agencies, Administrative decisions.

Definitions of the terms 'air pollution', 'water pollution', and 'land pollution' correspond to their respective definitions under the Environmental Protection Act, under this amendment to an Illinois Statute concerning abatement of air and water pollution. Furthermore, the Attorney General is empowered to prevent pollution by instituting proceedings in the circuit court of the county where the pollution is occurring. The court shall specify a time for answer, which shall be within 21 days of service of process, and issue an interim temporary restraining order. After default or answer, the court shall inquire into the alleged pollution and provide an appropriate order. Appeals from final orders are taken in the normal manner. The title of the Act is amended to read 'An Act in relation to the prevention and abatement of air, land and water pollution'. (Hart-Florida)
W71-09445

AN ACT TO CREATE SANITARY DISTRICTS IN CERTAIN LOCALITIES.
Public Act 76-2436, Illinois Legislative Service, p 558-559 (1970) amending Illinois Annotated Statutes ch 42, sec 260.

Descriptors: *Illinois, *Water districts, *Drainage, *Sewage disposal, Cities, Administrative agencies, Local governments, Public utilities, Treatment facilities, Streams, Legislation.

An Illinois statute concerning creation of sanitary districts for drainage and the disposal of sewage is amended to provide that the Board of Trustees shall have power to: (1) do everything necessary to establish waste treatment plants; (2) alter the course of, or enlarge, any watercourse and extend it into an incorporated area; (3) contract with the city for use of the treatment works by the city for reasonable compensation, with increased costs of its use to be paid by the city; (4) maintain the projects established; and (5) extend work beyond the limits of the district, provided that no taxes may be levied beyond the district, and the district shall be liable for damages incurred beyond its limits. (Hart-Florida)
W71-09446

GIBSON V CITY OF TAMPA (DISCHARGE OF MUNICIPAL SEWAGE INTO COASTAL WATERS).
154 So 842-843 (Fla 1934).

Descriptors: *Florida, *Municipal wastes, *Water pollution, *Pollution abatement, Sewage, Sewage disposal, Sewage treatment, Sewerage, Oysters, Shellfish, Cities, Domestic wastes, Water pollution sources, Waste treatment, Environmental sanitation, Impaired water quality, Pollutants, Treatment, Wastes, Water quality, Judicial decisions, Legal aspects, Remedies.

Plaintiff oyster grower sought to enjoin defendant city from discharging untreated sewage into coastal waters, to the detriment of plaintiff's oyster beds. The Supreme Court of Florida held plaintiff had not made a clear showing that equitable relief was justified, and thus affirmed the dismissal of plaintiff's bill of complaint. The court pointed out that the dismissal was without prejudice to plaintiff's rights, if any, to maintain an action at law to redress the alleged injury. (Madsen-Florida)
W71-09447

REUSS V MOSS-AMERICAN, INC (AUTHORITY FOR CITIZEN TO BRING QUI TAM ACTION FOR VIOLATION OF RIVERS AND HARBORS ACT).
123 F Supp 848-850 (ED Wis 1971).

Descriptors: *Rivers and Harbors Act, *Wisconsin, *Federal government, *Water pollution, Water pollution control, Water pollution sources, Water quality, Water quality control, Navigable waters, Legislation, Administrative decisions, Legal aspects, Judicial decisions.

Plaintiff citizen filed an action against defendant corporation for violation of the Rivers and Harbors Act. Defendant moved to dismiss, contending that only the Department of Justice can bring proceedings for violation of the Act. 33 U.S.C. Section 413 provides that the Justice Department shall conduct the legal proceedings necessary to enforce the provisions of section 407. Plaintiff based his action for violation of section 407 upon section 411, which provides for payment of part of the assessed fine to the person giving information which shall lead to conviction under section 407. Plaintiff contended that an informer may proceed with a civil action if the government fails to prosecute when a statutory reward is available. The United States District Court for the Eastern District of Wisconsin, however, found no implied right to bring a qui tam action under the Rivers and Harbors Act, because of the express provision for prosecution by the Department of Justice. Hence, defendant's motion to dismiss was granted. (Hart-Florida)
W71-09448

STATE V SLOTNESS (TRUST DOCTRINE LIMITED TO WATER-CONNECTED PURPOSES).
185 NW 2d 530-534 (Minn 1971).

Descriptors: *Minnesota, *Lake Superior, Ownership of beds, *Condemnation, Riparian land, Lake beds, Relative rights, Project purposes, Artificial use, Earth fill, Legal aspects, Judicial decisions, Eminent domain, Navigation.

Defendant riparian landowner had by landfill created new dry land extending from the low water mark of his upland property to the point of navigability of Lake Superior. Plaintiff state sought to condemn this fill land without payment of compensation to defendant. Plaintiff sought a declaratory judgment regarding compensation, claiming that, since the bed of the lake was held in trust for the people, defendant only held the filled portion of land as a tenant at sufferance. This claim postulated that one purpose of the trust doctrine was the holding of the lake bed for a public highway. Defendant contended that his rights in the filled land were limited only by the public right in exclusively water connected uses. The Minnesota Supreme Court, holding for defendant, declared that construction of a public highway was strictly a land use and not remotely connected with navigation or any other water connected public use. Compensation must be paid in such cases unless the condemnation is solely in aid of navigation. (Kohla-Florida)
W71-09449

6F. Nonstructural Alternatives

PRELIMINARY REPORT ON WIND-TIDE FLOODING IN NEW HANOVER COUNTY, NORTH CAROLINA.
Corps of Engineers, Wilmington, N.C.
For primary bibliographic entry see Field 04A.
W71-09335

FLOOD PLAIN INFORMATION, WILLAMETTE RIVER, JOHNSON, KELLOGG, AND MT. SCOTT CREEKS, MILWAUKIE-OAK GROVE-LAKE OSWEGO, OREGON.
Corps of Engineers, Portland, Oreg.
For primary bibliographic entry see Field 04A.
W71-09336

FLOOD HAZARD REPORT OF 4-7 JULY 1969 FLOOD, HURON RIVER, NORWALK CREEK, OHIO.
Corps of Engineers, Buffalo, N. Y.
For primary bibliographic entry see Field 04A.
W71-09337

FLOOD PLAIN INFORMATION, QUACHITA RIVER, BAYOU LAFOURCHE AND TRIBUTARIES, MONROE, LOUISIANA.
Corps of Engineers, Vicksburg, Miss.
For primary bibliographic entry see Field 04A.
W71-09338

SPECIAL FLOOD HAZARD INFORMATION REPORT ON ECONLOCKHATCHEE RIVER, ORANGE AND SEMINOLE COUNTIES, FLORIDA.
Corps of Engineers, Jacksonville, Fla.
For primary bibliographic entry see Field 04A.
W71-09339

FLOOD PLAIN INFORMATION, VERMILION RIVER, SKELLENGER CREEK, AND BONNEY CREEK, OHIO.
Corps of Engineers, Buffalo, N. Y.
For primary bibliographic entry see Field 04A.
W71-09340

A FLOOD INSURANCE MODEL FOR SHARING THE COSTS OF FLOOD PROTECTION,
Central Connecticut State Coll., New Britain. Dept. of Economics.
For primary bibliographic entry see Field 04A.
W71-09402

6G. Ecologic Impact of Water Development

A PRELIMINARY BIBLIOGRAPHY OF MATHEMATICAL MODELING IN ECOLOGY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W71-09025

AN INTRODUCTION TO THE NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS IN ECOSYSTEM MODELS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W71-09026

GUIDELINES FOR AGENCY STATEMENTS ON PROPOSED FEDERAL ACTIONS AFFECTING THE ENVIRONMENT.
Council on Environmental Quality, Wash, D.C.
For primary bibliographic entry see Field 06E.
W71-09208

THE COSSATOT RIVER --- ANOTHER LEGAL MILESTONE,
Don G. Cullimore.
American Forests, Vol. 77, No. 5, p. 8-10, May 1971, 61, 2 figures.

Descriptors: *Cost-benefit analysis, *Legal aspects, *Institutional constraints.
Identifiers: *Cossatot River, Arkansas, National Environmental Policy Act.

The author describes a landmark decision by a U.S. District Court judge in Arkansas forbidding construction of a dam across the Cossatot River in Arkansas because of noncompliance with the National Environmental Policy Act of 1969. Although ten million dollars had already been spent on the project, the author explains that the dam itself had not been contracted for. The controversy centered around the definition of costs and benefits of the project. (Holmes-Rutgers)
W71-09406

INTEGRATED RESOURCE MANAGEMENT,
I. W. Varty.
The Forestry Chronicle, Vol. 47, No. 1, p. 19-21, Feb. 1971, 8 references.

Descriptors: *Resource allocation, *Project planning, *Social aspects, *Political aspects.
Identifiers: *Canada, Canadian Water Act, Canadian Arctic.

This article is a summation of views expressed at the Acadian Entomological Society Symposium held September 2, 1970, at the University of New Brunswick on the entomologist's role in integrated resource management. The participants stressed the need for long range planning, adherence to well defined goals, and better coordination of bodies regulating the legislation on pollution as well as more ecological research on the effects of pollutants. (Holmes-Rutgers)
W71-09407

WHAT'S HAPPENING TO OUR SALT WATER MARSHES,
New York State Dept. of Environmental Conservation, Albany. Div. of Marine and Coastal Resources.
John J. Spagnoli.
The Conservationist, Vol. 25, No. 5, p. 22-27, April-May 1971, 2 figures, 9 ref.

Descriptors: *Marsh management, *Plant ecology, *Salt marshes.

The author describes the characteristics and benefits of salt marshes, explaining the natural as well as unnatural successions that take place. He details the effects of environmental pollutants on the salt marshes and repeats the arguments in favor of salt marsh protection. He cites particularly Dr. Odum's measurements of high annual production of dry matter in salt marshes because of their ability to fix organic matter from sunlight. (Holmes-Rutgers)
W71-09410

TURNABOUT ON THE CHATTOOGA,
Don G. Cullimore.
American Forests, Vol. 77, No. 2, p. 12-15, Feb. 1971, 55, 56, 2 figures.

Descriptors: *Water resource development, *Environmental effects, Cost-benefit analysis.
Identifiers: Chattooga River, Wild and Scenic Rivers Act.

The story of how and why the four dams on the Chattooga River in northeastern Georgia were not constructed by the U.S. Army Corps of Engineers is described in this article. In contrast to previous situations, where the author explains that the corps has decided to build or not to build dams on the basis of construction costs and economic returns, in this case the decision was made on the basis of environmental concerns. Even though the construction of the four dams had been approved by congress, the river was declared a wild and scenic river and therefore not to be dammed up. (Holmes-Rutgers)
W71-09411

THE SEAS - BEGINNING OR END,
For primary bibliographic entry see Field 07B.
W71-09413

07. RESOURCES DATA

7A. Network Design

A PROPOSED STREAMFLOW DATA PROGRAM FOR TEXAS,
Geological Survey, Austin, Tex.
C. R. Gilbert, and R. O. Hawkinson.

Geological Survey Open-file Report (Texas Dist No 126), Mar 1971. 52 p, 3 fig, 1 plate, 5 tab, 11 ref.

Descriptors: *Streamflow, *Data collections, *Network design, *Texas, Reviews, Evaluation, Programs, Project planning, Stream gages, Hydrologic data, Gaging stations, Regression analysis, Reservoirs, Surface waters, Natural flow, Regulated flow, Discharge measurement, Flow rates, Flow characteristics, Streamflow forecasting.

An evaluation of the streamflow data available in Texas was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were: (1) Definition of the long-term goals of the streamflow-data program in quantitative form; (2) examination and analysis of all available data to determine which goals have already been met; and (3) consideration of alternative programs and techniques to meet the remaining objectives. Although the present natural-streams data program in the eastern two-thirds of the State was found to be adequate, data collection in the regulated-streams systems is deficient. Data collection is needed to define the inflow-outflow characteristics at eight additional reservoirs on minor streams. Additionally, gaging of outflow is needed at six reservoirs on minor streams and at five reservoirs on principal streams where reservoir-contents data are presently collected. One additional gaging station is needed to monitor outflow from systems of floodwater-retarding reservoirs in the Trinity River basin south of Dallas. (Woodard-USGS)
W71-09094

NUMBER AND SPACING OF RAINFALL-GAUGES IN A DECIDUOUS FOREST STAND,
Wroclaw Univ. (Poland). Inst. of Botany; and Polish Academy of Sciences, Bialystok. Mammals Research Inst.
For primary bibliographic entry see Field 02B.
W71-09138

COMPUTERISED OPERATION OF DISTRIBUTION SYSTEMS,
City Water Board, San Antonio, Tex.
For primary bibliographic entry see Field 06A.
W71-09224

PERENNIAL ICE AND SNOW MASSES--A GUIDE FOR COMPILATION AND ASSEMBLAGE OF DATA FOR A WORLD INVENTORY.
For primary bibliographic entry see Field 02C.
W71-09311

A PROPOSED STREAMFLOW DATA PROGRAM FOR UTAH,
Geological Survey, Salt Lake City, Utah.
G. L. Whitaker.
Geological Survey Open-file Report, 1971. 46 p, 4 fig, 4 tab, 14 ref, append.

Descriptors: *Streamflow, *Project planning, *Network design, *Data collections, *Utah, Hydrologic data, Reviews, Evaluation, Stream gages, Flow characteristics, Water yield, Water resources development, Gaging stations, Regression analysis.
Identifiers: Streamflow characteristics, (Utah), Basin characteristics, Program planning.

The streamflow data available for Utah are evaluated and guidelines for planning future programs are presented. The portions of the Bear River basin in Wyoming and Idaho were included in the Utah report. Records for 98 gaging stations, which were representative of natural flow, were analyzed for statistical characteristics. Twelve drainage-basin characteristics were compiled for each station. Multiple-regression analyses were performed by electronic computer to relate streamflow characteristics to basin characteristics. The streamflow characteristics for ungaged sites in Utah could not be defined accurately enough by regression methods. The goals for current-purpose data are being met. Several existing sites were recommended as long-term trend stations. Programs for collecting data on stream environment are proposed. Also a network of gaging stations and alternate methods for achieving the goals for streamflow characteristics at ungaged sites are proposed. (Woodard-USGS)
W71-09332

7B. Data Acquisition

AN INTRODUCTION TO THE NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS IN ECOSYSTEM MODELS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W71-09026

TURBINE-DISCHARGE MEASUREMENTS BY CABLE-SUSPENDED CURRENT METERS,
Corps of Engineers, Omaha, Nebr. Missouri River Div.
For primary bibliographic entry see Field 08C.
W71-09052

RADIOISOTOPES AND TURBINE FLOW MEASUREMENTS,
Bureau of Reclamation, Denver, Colo.
J. C. Schuster, and R. L. Hansen.
Paper American Society of Civil Engineers National Water Resources Engineers Phoenix, Ariz, Jan, 1971. 18 p, 4 fig, 1 tab. 6 ref, append.

Descriptors: *Discharge measurement, *Hydraulic turbines, Pipelines, *Radioisotopes, Research and development, Experimental data, Tracers, *Flow measurement, Accuracy, Fluid mechanics, Field tests, Laboratory tests, Radiation measuring equipment, Colorado.
Identifiers: Pole Hill Powerplant (Colo), Dilution method.

During 1965 to 1970, the Atomic Energy Commission and Bureau of Reclamation cooperated in a research program for measuring discharge through high-head turbines and pumps using radioisotopes. Purpose of the research was to develop a method for making discharge measurements accurately, quickly, and with a minimum of personnel and equipment. Measurements were made on the Flatiron Power and Pumping Plant penstock to compare the relative accuracy of using the radioisotope-velocity, integrated sample, dilution, and total-count methods. Measuring equipment was installed at the Pole Hill Powerplant for measuring turbine discharge at the single-unit plant. Results indicated no superiority of any of the 3 methods used to measure the discharge radioisotope. Discharge measurements showed consistent results with an accuracy of plus or minus 1.5%. General observations are given for all 4 radioisotope measurement methods. (USBR)
W71-09066

PREDICTION OF IN-SITU ACOUSTIC AND ELASTIC PROPERTIES OF MARINE SEDIMENTS,
Naval Undersea Research and Development Center, San Diego, Calif.
For primary bibliographic entry see Field 02J.
W71-09096

A MULTIPLE CORER FOR SAMPLING PROFUNDAL BENTHOS,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 05A.
W71-09158

APPLICATION OF ASSOCIATION-ANALYSIS TO DISTRIBUTION STUDIES OF RECENT FORAMINIFERA,
Bedford Inst. Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05A.
W71-09177

RADIATION SURVEILLANCE - MONITORING THE ENVIRONS OF A NUCLEAR STATION,
Iowa-Illinois Gas and Electric Co.
For primary bibliographic entry see Field 05A.
W71-09249

THE DEVELOPMENT OF A WIDE RANGE IMAGE SPECTRO PHOTOMETER INFORMATION SYSTEM,
TRW Systems Group Redondo Beach, Calif.
Keith P. Jenkin, and Richard C. Ramsey.
Available from the National Technical Information Service as AD-721 385, $3.00 in paper copy, $0.95 in microfiche. Naval Oceanographic Office Contract Report, 25 Feb 71. 101 p.

Descriptors: *Water pollution, *Remote sensing, *Oil wastes, *Spectro photometry, Computers, Data storage and retrieval.
Identifiers: *Data processing systems, Airborne, *Ocean surveillance, Spectra Visible .. ultraviolet, Analog-to-digital converters, Computer storage devices, Display systems, Sensors, Spectrum signatures, WISP Widerange image spectrophotometers, *Management information systems, Oil slicks, Oil pollution.

A data handling system was developed for WISP data. The procedure for the reduction of the raw flight data to graphic displays were refined in the program. Computed-generated maps are presented which enhance the various scene features and these are based upon the selection of the appropriate algorithms to fit the scene information. Polarization measurements of the airlight directed upward over the oceans were obtained up to 10,000 feet altitudes. The high values of polarization obtained suggest a significant gain in signal contrast will result from use of polarizers in spacecraft ocean color sensors. Low altitude spectrometer flights over sewage outfalls and 'red tide' resulted in good correlation between the visible spectral nature of the upwelling light and ground truth turbidity and organisms counts. Useful algorithms were developed to best characterize the nature of the spectral data and the existing types of water pollution. Spectrometer measurements of a liberate oil spillage on the ocean indicated no visible signatures were present.
W71-09258

NIMBUS WEATHER SATELLITES: REMOTE SOUNDING OF THE ATMOSPHERE,
Gerald L. Wick.
Science, Vol 172, No 3989, p 1222-1223, June 18, 1971. 2 p, 5 ref.

Descriptors: *Weather data, *Satellites (Artificial), *Remote sensing, *Weather forecasting, *Atmospheric physics, Meteorological data, Application methods, Water vapor, Infrared radiation, Air temperature, Research and development, Instrumentation.
Identifiers: *Weather satellites (Nimbus), *Mapping (Weather).

Since inception in 1959 weather satellites have made a vast impact on the science of meteorology. From cameras in orbit cloud pictures and air movements could be determined--now a standard feature of weather forecasting--and infrared maps were made that show temperature variations. Instruments aboard Nimbus 3 (1969) and Nimbus 4 (1970) can now yield the vertical profile of air temperature between earth and the satellites. Global distribution of ozone and water vapor can also be measured. Carbon dioxide and temperature measurements techniques are described; and problems,

uch as cloud cover that obscures radiation from he earth's surface, are discussed. Constant surveil-ance by Nimbus of global temperature patterns rovides a unique opportunity to analyze known veather patterns and to spot previously unknown henomena. It was found, for example, that the 970 winter South Pole had two district cold re-ions at 45 Km where only one was expected. A ritish team and others observed 'sudden varmings' in the stratosphere over the winter lorth Pole where temperature over small areas ay rise as much as 50 deg K in a few days. One ear's highly successful operation in remote sound-ng of the atmosphere indicates an increasingly im-ortant source of data for meteorologists and thers for the future. (Lang-USGS)
W71-09271

FFECT OF CLAY ON THE ACCURACY OF HE HYDROMETER METHOD,
ndian Inst. of Tech., Kanpur. Dept. of Civil En-ineering.
. R. Madhav, and K. Subramanya.
edimentology, Vol 16, No 1-2, p 119-123, March 971. 5 p, 3 fig, 1 tab, 3 ref.

escriptors: *Particle size, *Hydrometry, *Densi-y, *Clays, *Settling velocity, Suspension, Viscosi-y, Particle shape, Clay minerals, Analytical echniques, Laboratory tests.
dentifiers: *Particle size analysis.

ven small colloidal clay fractions in suspension af-ect markedly the results from a hydrometer test. he discrepancies are due to non-consideration of pecific gravity and relative viscosity of the actual ay-water suspension. Therefore, actual (experi-entally or otherwise determined) values of pecific gravity and relative viscosity should be sed instead of the conventionally used values. nother simple but time-consuming remedy is to emove the clay content from the soil by repeated ecantation before conducting the hydrometer nalysis. (Knapp-USGS)
/71-09284

/ATER ANALYSIS,
eological Survey, Denver, Colo.
or primary bibliographic entry see Field 05A.
/71-09289

EOLOGICAL OBSERVATIONS OF THE IAMI TERRACE FROM THE SUBMERSIBLE EN FRANKLIN,
/oods Hole Oceanographic Institution, Mass.
or primary bibliographic entry see Field 02J.
/71-09290

EASUREMENTS OF THE ENGINEERING ROPERTIES OF MARINE SEDIMENTS,
aval Academy, Annapolis, Md. Dept. of Ocean ngineering.
or primary bibliographic entry see Field 02J.
/71-09291

OIL: A NATURAL SINK FOR CARBON ONOXIDE,
anford Research Inst., Irvine, Calif.
or primary bibliographic entry see Field 02G.
/71-09297

ELD STUDY OF SUBSURFACE SPENT ULFITE LIQUOR MOVEMENT USING EARTH ESISTIVITY MEASUREMENTS,
esearch Council of Alberta, Edmonton. Earth iences Branch.
or primary bibliographic entry see Field 05B.
/71-09302

/ALUATING GEOLOGIC HAZARDS WITH ULTIBAND PHOTOGRAPHY,
n Francisco State Coll., Calif. Dept. of Geology.
aymond Pestrong.
Journal of Remote Sensing, Vol 2, No 2, p 4-9, Apr-May 1971. 6 p, 1 fig, 4 photo.

Descriptors: *Remote sensing, *Cameras, *Aerial photography, *Terrain analysis, Hydrology, Watersheds (Basins), Surface waters, Topography, Vegetation, Methodology, Geology, Groundwater.
Identifiers: Drainage areas, Hydrologic regime.

A simple, effective multiband photographic system may be constructed from four synchronized 35 mm cameras, utilizing panchromatic black and white infrared, Kodachrome, and Ektachrome infrared films plus the appropriate filters. Such a system minimizes spectral duplication and provides unique photographic signatures for a variety of terrain features of interest to the land planner. All of the required films are readily available in 20-exposure 35 mm formats, thereby, facilitating utilization of the system with a minimum of specialized equipment. This type of analysis has been especially useful in the delineation of landforms along the margins of the San Francisco Bay, as well as for the location of large landslides in the nearby coast ranges. As the landslides disrupt drainage and vegetation, they show up most clearly on the Ektachrome infrared photographs. (Woodard-USGS)
W71-09304

SELF-OPERATED PIPETTE FOR GRAIN-SIZE ANALYSIS: A PROTOTYPE,
Florence Univ. (Italy). Inst. of Geology.
Carlo Bartolini.
Sedimentology, Vol 14, No 3/4, p 295-308, July 1970. 14 p, 12 fig, 11 ref.

Descriptors: *Silts, *Analytical techniques, *Particle size, *Settling velocity, *Automation, Suspension, Velocity, Mineralogy, Sedimentology, Sedimentation rates.
Identifiers: *Particle size analysis.

A self-operated pipette analyzes the silt fraction of a sample at half-phi intervals. Operator assistance is only required during the first four minutes of analysis. The procedure allows working three samples at a time twice a day. With a reduced height of fall nine samples could be easily treated in a working day. The total working time of the operator for the complete analysis of one sample (starting with already dispersed sample and including the weighing of the subsamples and the washing of the beakers) is about 30 min. (Knapp-USGS)
W71-09318

MINERAL STUDIES IN THE GRAVITATION-GRADIENT FIELD: 1. THE METHOD,
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 02J.
W71-09322

THE SEAS - BEGINNING OR END,
George F. Bond.
Catalyst for Environmental Quality, Vol. No. 1, p. 9-13, Spring 1970. 5 figures.

Descriptors: *Oceanography, *Research facilities, *Water pollution control.
Identifiers: Sealab I, II, III, Genesis, Tektite.

The author describes the oceanographic research efforts that have been undertaken primarily by the U.S. Navy since inauguration of the Genesis project in 1957. He explains the importance of these projects in relation to the problems of environmental pollution, weather prediction, food, resources and fresh water deficiencies. He stresses the need to concentrate more efforts on ocean ecology and undersea engineering because 'in the last analysis, the sum total residue of man's environmental pollutants will come to rest in the seas.' (Holmes-Rutgers)
W71-09413

7C. Evaluation, Processing and Publication

HYDROLOGIC STUDY OF THE YAGUEZ RIVER WATERSHED,
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.
Luis A. Nunez.
Available from the National Technical Information Service as PB-200 165, $20.00 in paper copy, $0.95 in microfiche. Technical Completion Report UPRICO-WRRI-FR-71-20-1 thru 11, Mar 1971, 11 Vol (1-7, 8A-8C, 9), dates vary. 1,348 p. OWRR Project A-020-PR (1).

Descriptors: Precipitation (Atmospheric), Runoff, Streamflow, *Data collections, *Hydrologic data, *Climatic data, Puerto Rico, Watersheds (Basins).
Identifiers: *Yaguez River watershed.

Data are presented from 13 pluviometric stations of the Yaguez River basin in eleven volumes consisting of 16 appendices. Station data and summaries include: Descriptions of the 13 pluviometric stations and conclusions and recommendations; Monthly total precipitation; Mean monthly precipitation; Annual total precipitation; Mean intensity of precipitation; Normal discharge of Yaguez River (1967-1969); Flood discharge of Yaguez River (1968-1969); Meteorological records (1959-1970); Chart analysis of water level recorder; and Mean Intensity of Precipitation (1970).
W71-08971

SIMULATION OF WATER RESOURCE REGIMES,
Maryland Univ., College Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 06A.
W71-08974

ECONOMIC-ECOLOGIC ANALYSIS IN THE CHARLESTOWN METROPOLITAN REGION: AN INPUT OUTPUT STUDY,
Clemson Univ., S.C. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 06A.
W71-09002

A PRELIMINARY BIBLIOGRAPHY OF MATHEMATICAL MODELING IN ECOLOGY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W71-09025

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR NORTH CREEK, TRINITY RIVER BASIN, TEXAS - 1969,
Geological Survey, Austin, Tex.
C. C. Kidwell.
Geological Survey Data Report, 1970. 32 p, 2 fig, 3 tab.

Descriptors: *Surface waters, *Hydrologic data, *Data collections, *Texas, *Rainfall-runoff relationships, Floods, Storms, Flood control, Stream gages, Discharge measurement, Flow rates, Water quality, Chemical analysis, Meteorological data, Hydrographs, Mass curves, Small watersheds.
Identifiers: *North Creek (Tex), Trinity River basin (Tex), Floodwalls

This report contains rainfall and runoff data for the 1969 water year for the 21.6-square-mile area above the stream-gaging station North Creek near Jacksboro, Texas. The location of proposed flood-water-retarding structures and hydrologic instruments are shown. The average rainfall during the 1969 water year was 32.94 inches, which is greater than the 12-year (1957-69) average of 31.02.

Monthly rainfall totals ranged from 0.67 inch in January to 5.51 inches in May. Rainfall was scattered throughout the year with every month receiving some rainfall. The mean daily discharge at the stream-gaging station was 4.71 cfs, compared with the 13-year average of 5.98 cfs. The annual runoff was 3,410 acre-feet, or 2.96 inches. Computations include detailed time breakdown of rainfall and discharge. Hydrographs and mass curves are drawn for illustration. Two chemical-quality samples were collected for analysis at the stream-gaging station North Creek near Jacksboro, Texas. The results of the chemical analyses are given. The water contained calcium and bicarbonate as the predominant ions. (Woodard-USGS)
W71-09080

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA AND MUKEWATER CREEK, COLORADO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex. Water Resources Div.
H. H. Hejl, Jr.
Geological Survey Data Report, 1970. 84 p, 2 fig, 3 tab.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Hydrologic data, *Data collections, *Texas, Small watersheds, Flow measurement, Stream gages, Runoff, Flow rates, Flow characteristics, Storms, Watershed management, Flood protection, Hydrographs, Mass curves, Reservoirs, Water storage, Water yield, Average flow.
Identifiers: *Mukewater Creek (Tex), Runoff computations, Flood-retarding structures, Water budget.

This report contains the rainfall, runoff, and storage data collected during the 1969 water year for the 70.0-square-mile area above the stream-gaging station Mukewater Creek at Trickham, Texas. All six of the floodwater-retarding structures in the Muke water Creek watershed are upstream from the stream-gaging station. The structures have a combined capacity of 5,790 acre-feet and control an area of 27.6 square miles, or 39% of the drainage area. The weighted-mean rainfall for the 1969 water year was 27.76 inches, or almost 114% of the 17-year (1953-1969) average of 24.45 inches. Monthly rainfall ranged from 0.04 inch in October to 4.96 inches in September. Mean daily discharge at the stream-gaging station was 3.91 cfs, compared with the 18-year average of 11.2 cfs. Annual runoff at the stream-gaging station was 2,830 acre-feet, or 0.76 inch. Three storms were selected for detailed computation including detailed time breakdown of rainfall and discharge. Hydrographs and mass curves are drawn for illustrations. (Woodard-USGS)
W71-09083

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR CALAVERAS CREEK, SAN ANTONIO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex. Water Resources Div.
J. M. Alexander.
Geological Survey Data Report, 1970. 56 p, 2 fig, 3 tab.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Hydrologic data, *Data collections, *Texas, Average flow, Small watersheds, Flow measurement, Stream gages, Runoff, Flow rates, Flow characteristics, Storms, Watershed management, Hydrographs, Mass curves, Reservoirs, Flood control, Water storage, Water yield.
Identifiers: *Calaveras Creek (Tex), Flood-retarding structures, Runoff computations.

This report contains the rainfall, runoff, and storage data collected during the 1969 water year for the 77.2 - square - mile area above the stream-gaging station Calaveras Creek near Elmendorf, Texas. There are seven floodwater-retarding structures in the Calaveras Creek watershed. These structures have a capacity for temporary storage of 8,640 acre-feet of flood runoff from 26.6 of the 77.2 - square-mile study area. All but one of the structures are upstream from Calaveras Lake. The mean rainfall for the 1969 water year was 30.91 inches, or 112% of the 14 year (1955-68) weighted-mean average. The average monthly-rainfall totals ranged from 0.42 inch in July to 6.02 inches in November. Mean daily discharge at the stream-gaging station, Calaveras Creek near Elmendorf, was 1.16 cfs. This shows the effect of Calaveras Dam on the basin as the average discharge for the preceding 14 years was 10.7 cfs. Annual runoff at the stream-gaging station was 839 acre-feet, or 0.20 inch. Three storms were selected for detailed computations including detailed time breakdown of rainfall and discharge. Hydrographs and mass curves are drawn for illustrations. (Woodard-USGS)
W71-09084

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE AUSTIN, TEXAS METROPOLITAN AREA, 1969,
Geological Survey, Austin, Tex., Water Resources Div.
W. D. Robbins.
Copies of report may be obtained at US Geological Survey, Water Resources Div, Federal Bldg, 300 E8th St, Austin, Tex, 78701. Geological Survey Data Report, 1970. 46 p, 3 fig, 1 tab.

Descriptors: *Rainfall-runoff relationships, *Urbanization, *Cities, *Hydrologic data, *Texas, Data collections, Small watersheds, Watershed management, Streamflow, Flow measurements, Flow rates, Average flow, Runoff, Storms, Storm drains, Hydrographs, Mass curves, Water yield, Peak discharge.
Identifiers: *Urban hydrology, *Austin (Tex).

Rainfall and runoff data are presented for the Waller Creek and Wilbarger Creek study areas for the 1969 water year. The Waller Creek drainage area lies entirely within the city of Austin, with the headwaters originating in the northern part of the city. The creek flows south for 6.6 miles to the Colorado River. Storm sewers and street gutters divert runoff both into and out of the natural drainage area. The weighted-mean rainfall upstream from 38th Street was 30.25 inches, 7% below the mean annual rainfall for Austin of 32.58 inches. Mean daily discharge was 1.38 cfs; annual runoff was 8.08 inches, or 27% of rainfall. The headwaters of Wilbarger Creek originate in Travis County near the Williamson County line. The creek flows southeasterly about 40 miles to the Colorado River. The Wilbarger Creek study area is about 15 miles north of the city of Austin. Weighted-mean rainfall in this study area was 27.92 inches, 14% below the mean annual rainfall for Austin. Mean daily discharge was 1.49 cfs; annual runoff was 4.40 inches, or 16% of the rainfall. (Woodard-USGS)
W71-09086

PUBLIC AND INDUSTRIAL WATER SUPPLIES IN SOUTHERN MISSISSIPPI,
Geological Survey, Jackson, Miss.
J. A. Callahan.
Mississippi Board of Water Commissioners Bulletin 71-1, 1971. 61 p, 5 fig, 10 ref.

Descriptors: *Water supply, *Industrial water, *Domestic water, *Water resources development, *Mississippi, Groundwater, Surface waters, Water yield, Water quality, Aquifer characteristics, Hydrologic data, Data collections, Public utilities, Water utilization, Pumping, Water storage, Chemical analysis, Withdrawal, Water wells, Water levels, Rivers.
Identifiers: *Public water supply, *Industrial water supply.

Data on the public and industrial water supplies of 37 counties in southern Mississippi are presented. Information for each public-supply system includes population served, average daily pumpage, storage, treatment, well descriptions, and chemical analyses if available. Estimated self-supplied industrial water use is given for each county, and industrial-supply wells are described. Total public- and industrial-supply pumpage in 1970 amounted to 1,300 mgd. Of the 1,090 mgd pumped from surface-water sources, 540 mgd were brackish water from Back Bay of Biloxi and the Pascagoula River estuary. All public water supplies except those at Jackson and Meridian are obtained from aquifers of Eocene age and younger. Although the greater number of industrial supplies are obtained from Miocene aquifers most of the water pumped for industrial use is from surface sources. (Woodard-USGS)
W71-09091

SIMULATION OF TIDAL MOTION IN COMPLEX RIVER SYSTEMS AND INLETS BY A METHOD OF OVERLAPPING SEGMENTS,
Department of Energy, Mines and Resources, Ottawa (Ontario). Marine Sciences Branch.
For primary bibliographic entry see Field 02L.
W71-09093

GROUNDWATER DATA AS OF 1967--COLORADO DESERT SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. S. Bader.
Geological Survey Open-file Report, Mar 5, 1969. 19 p, 1 fig, 50 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Reviews, Water table, Water levels, Water yield, Specific capacity, Withdrawal, Pumping, Groundwater recharge, Water temperature, Water quality, Chemical analysis, Dissolved solids, Aquifers, Hydrogeology, Water resources development.
Identifiers: *Groundwater resources.

Most usable groundwater in the Colorado Desert Subregion occurs in the alluvium-filled valleys that occupy about half the subregion. The alluvium consists generally of lenticular beds of unconsolidated to semiconsolidated clay, silt, sand, and gravel of Cenozoic age. The intervening mountainous areas are underlain by consolidated sedimentary, igneous, and metamorphic rocks, mainly of Mesozoic age or older. These rocks contain only small quantities of recoverable groundwater. Total storage capacity of the 45 basins is nearly 158,000,000 acre-feet. The usable storage capacity has been determined only for Coachella Valley where it is 3,600,000 acre-feet. Groundwater temperature ranges from about 60 deg to about 90 deg F, but temperatures of more than 500 deg F have been observed locally. The dissolved solids content of the water varies greatly (from less than 600 to more than 300,000 parts per million), depending on local conditions. The predominant water type is sodium sulfate or sodium chloride. Properly constructed wells in some areas can yield as much as 3,900 gallons per minute. (Woodard-USGS)
W71-09142

SUMMARY OF THE GROUNDWATER DATA AS OF 1967--CALIFORNIA REGION,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02F.
W71-09143

GROUNDWATER DATA AS OF 1967--NORTH COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo, Calif. Water Resources Div.
J. S. Bader.
Geological Survey Open-file Report, Mar 5, 1969. 11 p, 1 fig, 20 ref.

escriptors: *Groundwater, *Water wells, Hydrologic data, *Aquifer characteristics, California, Water levels, Water table, Reviews, Water yield, Specific capacity, Withdrawal, Pumping, Groundwater recharge, Water temperature, Water quality, Dissolved solids, Chemical analysis, quifers, Hydrogeology, Water resources development.
dentifiers: *Groundwater resources.

lost usable groundwater in the predominantly ountainous North Coastal Subregion occurs in idely scattered alluvium-filled valleys and coastal ains. The alluvium consists generally of lenticular eds of unconsolidated to semiconsolidated clay, lt, sand, and gravel of Cenozoic age. The interening mountainous areas are underlain by conlidated sedimentary, igneous, and metamorphic cks mainly of Mesozoic age or older. These older cks contain only small quantities of recoverable oundwater. Total storage capacity of the 13 asins for which determinations have been made is early 1,000,000 acre-feet. The usable storage apacity is 700,000 acre-feet; the limiting factors e the possibility of sea-water intrusion and quifer materials of low permeability. Groundwater mperature ranges from about 50 deg to about 70 eg F, but locally is as low as 43 deg and as high as 78 deg F. The dissolved-solids content of the ater is generally less than 500 parts per million, it locally is more than 4,800 parts per million. he predominate water type is calcium bicarbnate. Properly constructed wells in some areas n yield as much as 4,000 gallons per minute. Woodard-USGS)
71-09144

ROUNDWATER DATA AS OF 1967--SOUTH AHONTAN SUBREGION, CALIFORNIA,
cological Survey, Menlo Park, Calif. Water esources Div.
S. Bader.
cological Survey Open-file Report, Mar 5, 1969. p, 1 fig, 70 ref.

escriptors: *Groundwater, *Water wells, Hydrologic data, *Aquifer characteristics, California, Reviews, Water table, Water levels, ater yield, Specific capacity, Withdrawal, Pumpg, Groundwater recharge, Water temperature, ater quality, Chemical analysis, Dissolved solids, quifers, Hydrogeology, Water resources development.
entifiers: *Groundwater resources.

ost usable groundwater in the predominantly ountainous South Lahontan Subregion occurs in e alluvium-filled valleys. The alluvium consists nerally of lenticular beds of unconsolidated to nconsolidated clay, silt, sand, and gravel of enozoic age. The intervening mountainous areas e underlain by consolidated sedimentary, igneus, and metamorphic rocks, mainly of Mesozoic e or older. These rocks contain only small quanies of recoverable groundwater. Total storage pacity of the 50 basins is more than 134,000,000 re-feet. The usable storage capacity has been terminedonly for Indian Wells Valley where it is 20,000 acre-feet. Groundwater temperature nges from about 50 deg to about 80 deg F, but s been observed locally as high as 286 deg F. The ssolved-solids content of the groundwater varies dely (from less than 800 to more than 400,000 rts per million) from valley to valley. The edominant water type is sodium bicarbonate. operly constructed wells in some areas can yield much as 3,800 gallons per minute. (Woodard-SGS)
71-09145

ROUNDWATER DATA AS OF 1967--NORTH AHONTAN SUBREGION, CALIFORNIA,
cological Survey, Menlo Park, Calif.
S. Bader.
cological Survey, Open-file Report, Jan 29, 1969. p, 1 fig, 15 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Reviews, Water table, Water levels, Water yield, Specific capacity, Withdrawal, Pumping, Groundwater recharge, Water temperature, Water quality, Chemical analysis, Dissolved solids, Aquifers, Hydrogeology, Water resources development.
Identifiers: *Groundwater resources.

Most usable groundwater in the predominantly mountainous North Lahontan Subregion occurs in scattered valleys that are filled with alluvium and material of volcanic origin. The intervening mountainous areas are underlain mainly by igneous rocks of Mesozoic and Cenozoic age. These rocks contain only small quantities of recoverable groundwater. Total storage capacity of seven of the eight basins is nearly 23 million acre-feet. However, the usable storage capacity has not been determined; the limiting factor is the quality of the water. Groundwater temperature ranges from about 50 deg to about 80 deg F, but locally is as high as 182 deg F. The dissolved-solids content of the water is generally less than 500 parts per million, but locally is as much as 2,030 ppm. The predominant water type is calcium bicarbonate. Properly constructed wells in some areas can yield as much as 3,800 gallons per minute. (Woodard-USGS)
W71-09146

GROUNDWATER DATA AS OF 1967--SAN JOAQUIN BASIN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. S. Bader.
Geological Survey Open-file Report, Mar 5, 1969. 16 p, 1 fig, 112 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Reviews, Water table, Water levels, Water yield, Specific capacity, Withdrawal, Pumping, Groundwater recharge, Water temperature, Water quality, Chemical analysis, Dissolved solids, Aquifers, Hydrogeology, Water resources development.
Identifiers: *Groundwater resources.

Nearly all usable groundwater in the San Joaquin Basin Subregion occurs in the alluvium-filled San Joaquin Valley. The aquifer system throughout the entire San Joaquin Valley is an integrated system; therefore, this report includes the Delta-Central Sierra Subregion, the Tulare Basin Subregion, and the San Joaquin Basin Subregion. Total storage capacity of the San Joaquin Valley is 93 million acre-feet. The usable storage capacity is 80 million acre-feet; low permeability in some areas is considered a limiting factor. Groundwater temperature ranges from about 45 degrees to about 105 degrees F. The dissolved-solids content of the water ranges from 64 to 10,700 parts per million. The predominant water type varies with the aquifer, but calcium, magnesium, sodium, bicarbonate, sulfate, and chloride are the main constituents. (Woodard-USGS)
W71-09147

GROUNDWATER DATA AS OF 1967--SACRAMENTO BASIN SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. S. Bader.
Geological Survey Open-file Report, Mar 5, 1969. 16 p, 1 fig, 31 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Reviews, Water table, Water levels, Water yield, Specific capacity, Withdrawal, Pumping, Groundwater recharge, Water temperature, Water quality, Chemical analysis, Dissolved solids, Aquifers, Hydrogeology, Water resources development.
Identifiers: *Groundwater resources.

Most usable groundwater in the predominantly mountainous Sacramento Basin Subregion occurs in alluvium-filled valleys and volcanic rocks of Quaternary and Tertiary age. Total storage capacity of 17 of the 21 basins is nearly 55 million acre-feet, of which more than 33 million is in the Sacramento Valley. The usable storage capacity in the Sacramento Valley is 22 million acre-feet; the limiting factors are economic considerations, aquifer materials of low permeability, and the quality of the water. Groundwater temperature ranges from about 55 degrees to about 75 degrees F. The dissolved-solids content of the water is generally less than 55 parts per million, but locally is as much as 2,790 ppm. The predominant water type is calcium bicarbonate, but sodium and magnesium are present locally in significant quantities. Properly constructed wells in some areas can yield as much as 3,100 gallons per minute. (Woodard-USGS)
W71-09148

A COMPUTER BASED FLORISTIC ANALYSIS OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 05A.
W71-09211

GRAPHICAL CONVERSION OF A STAGE HYDROGRAPH TO A DISCHARGE HYDROGRAPH,
Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 02E.
W71-09275

HYDRAULIC TESTING OF WELL HTH-23 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-09324

HYDRAULIC TESTING OF WELL HTH-4 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-09325

HYDRAULIC TESTING OF WELL HTH-3 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-09326

HYDRAULIC TESTING OF WELL HTH-5 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-09327

HYDRAULIC TESTING AND SAMPLING OF HOLE Ue-1, IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-09328

HYDRAULIC TESTING AND SAMPLING OF HOLE Ue-2, IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-09329

HYDRAULIC TESTING AND SAMPLING OF HOLE Ue-3, IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02F.
W71-09330

HYDRAULIC TESTING OF WELL HTH-21-1 IN CENTRAL NEVADA,
Geological Survey, Denver, Colo.

For primary bibliographic entry see Field 02F.
W71-09331

08. ENGINEERING WORKS

8A. Structures

FIELD COMPARISON OF SEVERAL TRENCH AND GRAVEL ENVELOPE DESIGNS,
Bureau of Reclamation, Sacramento; and California Univ., Davis.
For primary bibliographic entry see Field 04A.
W71-09054

CALCULATION OF THE FOUNDATION OF ARCH DAMS,
F. G. Tskhadaia, V. S. Zhgenti, and G. N. Khazaliia.
Bur Reclam Transl 847, Jan, 1971. 52 p, 4 fig, 23 tab, 2 ref, append. Trans. of Vychisl tsentr, Akad Nauk Gruz SSR Tbilisi, 1968.

Descriptors: Foreign design practices, Mathematical analysis, *Arch dams, *Dam foundations, *Dam design, Hydraulic structures, Abutments, Design tools, Boundary values, Dams, Concrete dams, Foundations, Loads (Forces), *Deformation, *Displacements, Equations, Strain, Movement, Analytical techniques, Rotation, Formulas.
Identifiers: Vertical displacements, Horizontal displacements, USSR.

Vogt's method of analysis of arch dam foundations is modified to allow a parabolic distribution of load. Expressions for normal and horizontal displacement and angle change of the foundation are developed for normal, moment, and shearing loads. Lengthy expressions for constants used in the calculations which are a function of the foundation geometry and the location along the foundation are separated and identified. Tables of values for the constants are given for the expected range of foundation geometry and location along the foundation. The geometrical description of the foundation used for determining the parameters of the tables is given. (USBR)
W71-09071

TESTS FOR TUNNEL SUPPORT AND LINING REQUIREMENTS,
Bureau of Reclamation, Denver, Colo.
G. B. Wallace, and W. H. Ortel.
Paper 12th Symposium on Rock Mechanics University of Missouri, Rolla, Mo, Nov, 1970. 27 p, 27 fig, 9 ref.

Descriptors: *Tunnel linings, *Tunnel supports, *Rock pressures, Loads (Forces), Rock bolts, Safety, Tunnel design, *Instrumentation, Measuring instruments, Pressure cells, Extensometers, Slope indicators, Analytical techniques, Strain meters, Strain gages, Rock mechanics, Deformation, In situ rock, Geology, Measurement.
Identifiers: Load cells, Joint meters, Photoelastic stress meters, Analytical method.

Tunnel measurements and their analysis may be the key that will give the insight necessary for understanding the relationship of rock, tunnel supports, and linings, resulting in improved safety, design methods, and geological interpretation of tunnel requirements. To accomplish these goals, the Bureau of Reclamation developed a tunnel instrument program to measure rock movement, loads on supports and linings, relative movement between rock and lining, and stresses in supports and lining. The instruments and the techniques used to install the instruments, as well as typical examples of output results are described. Instruments include tunnel diameter gage, single- and multiple-position extensometers, slope indicators, load and pressure cells, joint and strain meters, welded and bonded resistance strain gages, and photoelastic gages. (USBR)
W71-09076

DETERMINATION OF CHANNEL CAPACITY OF THE FRESNO RIVER DOWNSTREAM FROM HIDDEN DAMSITE, MADERA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 08B.
W71-09092

FLUID FORCE ANALYSIS AND ACCELERATING SPHERE TESTS,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering; and Notre Dame Univ., Ind. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-09109

COASTAL REGIME - RECENT U. S. EXPERIENCE,
Corps of Engineers, Washington, D.C. Coastal Engineering Research Center.
For primary bibliographic entry see Field 08B.
W71-09141

NAVIGATION CONDITIONS AT LOCKS AND DAM NO. 4 MONONGAHELA RIVER, PENNSYLVANIA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, and Cody D. McKellar, Jr.
Available from the National Technical Information Service as AD-720 548, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-736, Aug 1966. 55 p.

Descriptors: *Dams, *Model studies, *Flow, *Test procedures, Navigation, Locks, Pennsylvania.
Identifiers: *Hydraulic models, Pennsylvania, Waterways, Monongahela River (Pa).

Existing Locks and Dam No. 4 consist of two parallel locks with clear chamber dimensions of 56 by 720 ft and 56 by 360 ft and a fixed dam 540 ft long. Reconstruction of Dam 4 will involve replacement of the existing fixed dam with a nonnavigable-type gated dam with five 84-ft-wide gates and four 10-ft-wide piers. Provision will be made in the dam structure for ultimate replacement of the existing locks by two locks each 720 ft long, with one lock 84 ft wide and the other 110 ft wide. A 1:120-scale, fixed-bed model reproducing approximately 2.5 miles of the Monongahela River was used to determine the effect of the proposed reconstructed dam on flow conditions in the lock approaches with the existing and ultimate locks and for the development of modifications which might be required to provide satisfactory navigation conditions. Results indicated that stages upstream of the dam would be lowered and velocities in the upper approach would be increased during uncontrolled riverflows. The maximum flow at which navigation through the locks if feasible would be increased about 30 percent. With the lower stages and resulting higher velocities, tows would experience greater difficulties in approaching the existing locks. Conditions with the existing locks could be improved by construction of cells spaced about 20 ft apart as extensions to the existing guard wall; with the ultimate locks, ports should be provided in the upper guard wall to reduce or eliminate the strong crosscurrents near the end of the wall. Velocities in the upper lock approach could be reduced by deepening the channel along the left bank above the dam and by placing spoil on the channel bed on the right side. Removal of the spur dike upstream of the locks would increase velocities in the approach, but would improve the alignment of currents.
W71-09359

NAVIGATION CONDITIONS AT BELLEVILLE LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W71-09360

8B. Hydraulics

SMALL CHECK-DROP-ENERGY DISSIPATOR STRUCTURES,
Colorado State Univ., Fort Collins.
G. V. Skogerboe, V. T. Somoray, and W. R. Walker.
Paper 70-748, 1970 Winter Meet, American Society of Agricultural Engineers, Chicago, Ill Dec, 1970. 16 fig, 8 tab, 23 ref.

Descriptors: Check structures, Drops (Structures), Discharge (Water), *Energy dissipators, Bibliographies, *Design criteria, Design, Hydraulic jump, *Laboratory tests, Models, *Model tests, Hydraulics, Research and development, Stilling basins, Spillways, Critical depth, Hydraulic structures, Costs.
Identifiers: Baffle blocks.

Existing information has been used extensively in developing design relationships for various geometric forms of check-drop-energy dissipator structures. Design criteria for numerous types of rigid boundary stilling basins are available, but much of the literature is concerned with particular structures for special use rather than general information. The material of general nature is scattered in numerous laboratory and project reports or design manuals. The problem is to evaluate existing information to determine what research is necessary for developing generalized design procedures. Once the necessary basic research is available, various types of structures can be designed, but verifying the designs by laboratory model studies will be desirable. Examples of check-drop-energy dissipator structures illustrate that information is available for designing rigid boundary stilling basins over a wide range of flow conditions. (USBR)
W71-09075

DETERMINATION OF CHANNEL CAPACITY OF THE FRESNO RIVER DOWNSTREAM FROM HIDDEN DAMSITE, MADERA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
Gilbert L. Bertoldi, and J. C. Blodgett.
Geological Survey Open-file Report, 1971. 45 p, 3 fig, 3 tab, 6 ref.

Descriptors: *California, *Flood routing, *Channel improvement, *Design flood, *Flood protection, Flash floods, Maximum probable flood, Historic flood, Regional flood, River forecasting, Dikes, Flood control, Floodgates, Floodproofing, Cloudbursts, Peak discharge, Multiple-purpose projects, River basin development.
Identifiers: *Madera County (Calif), *Madera (Calif), *Fresno River (Calif).

A channel capacity study was made in the general vicinity of the town of Madera some 25 miles northwest of Fresno, California to aid in the evaluation of a major flood control project in that area. This project included portions that had been inundated in the past and was especially designed to cover those areas affected by the flood of February 24-25, 1969. The adequacy of the existing channel was investigated using 89 flood profiles at various discharges ranging from 2,500 cfs to 18,000 cfs. Computed water-surface elevations indicate that discharges of 5,000 cfs and 8,000 cfs easily be contained within the channel. Upstream from the Railway bridge, a discharge of 10,000 cfs will cause local flooding. Flooding of agricultural land south of the Fresno River and between cross sections 64 and 68 could occur if a discharge of 10,000 cfs were routed entirely down the main channel. However, the South Fork normally carries flows when the main channel flow exceeds about 1,500 cfs. (Glasby-USGS)
W71-09092

EHAVIOR OF POROUS BED NEAR FLOW NGULARITY,
arlsruhe Univ. (West Germany). Institut fuer ydromechanik, Straunanlagen and Wasserversorng; and Georgia Inst. of Technology, Atlanta. hool of Civil Engineering.
r primary bibliographic entry see Field 02G.
71-09108

LUID FORCE ANALYSIS AND ACCELERATG SPHERE TESTS,
rthwestern Univ., Evanston, Ill. Dept. of Civil gineering; and Notre Dame Univ., Ind. Dept. of vil Engineering.
allis S. Hamilton, and James E. Lindell.
SCE Proceedings, Journal of the Hydraulics Divion, Vol 97, No HY6, Paper 8195, p 805-817, ne 1971. 13 p, 4 fig, 14 ref, append. NSF Grant GK 479.

escriptors: *Earthquakes, *Hydrodynamics, arthquake engineering, Fluid friction, Pressure, elocity, Hydrostatic pressure.
entifiers: Fluid force.

rge fluid forces are exerted on dams and other derwater structures when the structures are acelerated by earthquakes. Similarly, piles and offore towers subjected to waves must be able to thstand large forces caused by the accelerating id. The accelerative force problems of interest to gineers frequently involve periodic motion, but nperiodic motion also is important. Whether or t the motion is periodic, the presence of a surunding fluid demands that the external force aped to a body to produce a stipulated acceleration larger than would be required if the fluid were sent. The body behaves as if a mass in addition to own were attached to it. This is the concept of ded mass. The mean added mass coefficient from acceleration tests on 4-inch and 6-inch spheres eased from rest in water was 0.501. Because the ded mass coefficient from inviscid theory is 0.50, viscosity of the water did not influence the ded mass. Seventy-eight measurements imediately after acceleration from nominally connt speeds of 0.1 fps to 0.7 fps showed no tenncy of the coefficient to depend on speed or on ether the acceleration was in the same direction the velocity or in the opposite direction. (Knapp-GS)
71-09109

EPAGE EFFECT ON CHANNEL BANK STALITY,
reau of Reclamation, Denver, Colo. Hydraulics achinery Branch; and Colorado State Univ., Fort llins. Dept. of Civil Engineering.
r primary bibliographic entry see Field 04A.
71-09110

OSS-BEDDED TIDAL MEGARIPPLES FROM NG SOUND (NORTHWESTERN AUSALIA),
reau of Mineral Resources, Geology and ophysics, Canberra (Australia).
C. Gellatly.
dimentary Geology, Vol 4, N-2, p 185-191, June 70. 7 p, 5 fig, 1 tab, 11 ref.

scriptors: *Ripple marks, *Sand waves, *Sedintary structures, *Sediment transport, *Tidal effts, Currents (Water), Tides, Bottom sediments, nds, Channel morphology, Water level fluctuans.
entifiers: Cross-bedding.

gration of megaripples and sand waves in shalv seas and estuaries suggests a possible model for formation of widespread marine cross-bedding. st examples have been studied only externally, ny of them from echo-sounding; their internal ucture is unknown, but cross-bedding has been umed. Megaripples in King Sound are exposed low tide and their internal structure has been exined. Many are cross-bedded with steeply dipping foresets. Facing of the foresets indicates that they may be developed by either the flood or ebb tide. The current direction implied by external morphology appears to be a reliable guide to that indicated by the cross-bedding. (Knapp-USGS)
W71-09122

SKEWNESS AS AN ENVIRONMENTAL INDICATOR IN THE SOLANI RIVER SYSTEM, ROORKEE (INDIA),
Oil and Natural Gas Commission, Ahmedabad (India).
For primary bibliographic entry see Field 02J.
W71-09123

COASTAL REGIME - RECENT U. S. EXPERIENCE,
Corps of Engineers, Washington, D.C. Coastal Engineering Research Center.
Thorndike Saville, Jr., and George M. Watts.
Available as Army Corps of Engineers Coastal Engineering Research Center Reprint 3-70, June 1969. Reprint of Paper from 22nd International Navigation Congress, Section 2, Subject 4, Paris, 1969. 23 p, 14 fig, 28 ref.

Descriptors: *Coastal engineering, *Ocean waves, *Littoral, *Beaches, *Sediment transport, Shore protection, Hydraulic structures, Model studies, Laboratory tests, Test procedures, Harbors, Beach erosion, Engineering structures.
Identifiers: Wave forecasting.

Laboratory and field studies are discussed in developing a better understanding of the interaction of the beach and the littoral zones with and without manmade structures. Wave action is the most important factor influencing movement of sediments along U.S. shores. In many localities, the direction and rate of material movement may be determined directly from the rates of accretion and erosion at shore structures. Such determinations are accurate at the initial installation of the structure, or after cleaning a deposition area by a sand bypassing operation. Where there is no background of experience from shore structures, information on the direction (but not magnitude) of littoral movement can be obtained in many areas from the shore patterns near headlands where sediment accumulates on the updrift side, and an eroded embayment occurs on the downdrift side. A summary of major littoral factors pertinent to design of coastal works is included. (Woodard-USGS)
W71-09141

RIVER BED DEGRADATION,
Asian Inst. of Tech., Bangkok (Thailand).
Sadequr Rahman.
M Sc Thesis No 266, Asian Institute of Technology, 1969. 87 p, 31 fig, 4 tab, 22 ref, 4 append.

Descriptors: *Streamflow, *Channel erosion, *Dams, Regulated flow, *Sediment transport, Model studies, Flumes, Sediments, Particle size, Analytical techniques, Mathematical studies, Shear, Stress analysis, Roughness coefficient, Equations, Channel morphology.
Identifiers: Channel degradation.

The construction of a dam across a river changes the position of the streambed and water levels downstream from the dam. A study of these changes was made. Experimental investigation was conducted in a recirculating rectangular flume. The flume was 72 ft long, 2 ft wide and 2.5 ft deep. The sand bed layer was 8 inches high. Bed materials were almost uniform size having a medium diameter of 0.42 mm and a standard deviation of 1.27. Analytical solution was done using Tinny's theory, with some modifications. The result of the bed degradation obtained by computation agree reasonably with the measured data, except near the dam where the observed degradation was more than the computed one with a maximum difference of 35%. Critical shear stress sediment characteristic and roughness coefficient were also determined from the laboratory data. (Woodard-USGS)
W71-09149

MODEL STUDIES OF NAVIGATION IMPROVEMENTS, COLUMBIA RIVER ESTUARY. REPORT 1. HYDRAULIC AND SALINITY VERIFICATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Frank A. Herrmann, Jr.
Available from the National Technical Information Service as AD-720 545, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-735, Dec 1968. 262 p.

Descriptors: *Break waters, *Model studies, *Estuaries, *River flow, Salinity Tides, Sedimentation, Test procedures, Jetties, Columbia River.
Identifiers: *Hydraulic models, Test equipment.

The Columbia River estuary model was a combination fixed-bed and movable-bed model, constructed to scales of 1:500 horizontally and 1:100 vertically, and reproduced the lower 52 miles of the Columbia River and an adjoining portion of the Pacific Ocean. The model was equipped with the necessary appurtenances for accurate reproduction and measurement of tides, tidal currents, salinity intrusion, freshwater inflow, shoaling distribution, and other significant prototype phenomena. The purpose of the model study was to determine optimum plans for the rehabilitation of the stone jetties in the river entrance, to determine and evaluate the effects of a proposed enlargement of the existing navigation channel from 35 by 500 ft to 40 by 600 ft, and to develop and evaluate various plans for the reduction of maintenance dredging costs throughout the model area. Model verification tests indicated that the model hydraulic and salinity regimens were in satisfactory agreement with those of the prototype for comparable conditions. It therefore can be assumed that the model provided quantitative answers concerning the effects of the proposed plans on the hydraulic and salinity regimens of the estuary. (See also W71-09342 and W71-09343)
W71-09341

MODEL STUDIES OF NAVIGATION IMPROVEMENTS, COLUMBIA RIVER ESTUARY REPORT 2. ENTRANCE STUDIES, SECTION 1. FIXED-BED STUDIES OR SOUTH JETTY REHABILITATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Frank A. Herrmann, Jr., and Henry B. Simmons.
Available from the National Technical Information Service as AD-720 546, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-735, Aug 1966. 163 p.

Descriptors: *Breakwaters, *Model studies, *Estuaries, *Jetties, River flow, Tides, Salinity, Test procedures, Columbia River, Tides, Sedimentation.
Identifiers: *Hydraulic models, Damage control.

The existing comprehensive fixed-bed model of the Columbia River estuary was used to determine the need for rehabilitating all or part of the outer end of the existing south jetty. This jetty has seriously deteriorated during the past 25 years, and an extensive rehabilitation program has been undertaken. Model tests were conducted to determine the effects of various stages of repair of the outer 1900 ft of the jetty on the hydraulic, salinity, and shoaling characteristics of the entrance area. Tests results consist of tidal elevation measurements, current velocity measurements, salinity measurements, photographs of surface and bottom current patterns, and shoaling patterns. The results of the model tests indicate that rehabilitation of the existing outer end of the south jetty will not significantly benefit the hydraulic, salinity, or shoaling characteristics of the entrance area as a whole, although it is possible that some additional protection to vessel traffic from ocean wave action would be effected by the rehabilitation. The test results indicate further that shoaling of the entrance channel will

be significantly reduced, especially at the inner bar, if the seaward 1900 ft of the south jetty is allowed to degrade to an elevation of about -15 ft mllw. (See also W71-09341)
W71-09342

MODEL STUDIES OF NAVIGATION IMPROVEMENTS, COLUMBIA RIVER ESTUARY. REPORT 2. ENTRANCE STUDIES. SECTION 2. FIXED-BED STUDIES OF NORTH JETTY REHABILITATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Frank A. Herrman, Jr., and Henry B. Simmons.
Available from the National Technical Information Service as AD-720 547, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-735, Nov 1966. 157 p.

Descriptors: *Breakwaters, *Model studies, *Estuaries, *Riverflow, Jetties, Test procedures, Columbia River, Salinity, Tides, Sedimentation.
Identifiers: *Hydraulic models, Damage control.

The existing, comprehensive fixed-bed model of the Columbia River estuary was used to determine the need for rehabilitating all or part of the outer end of the existing north jetty. This jetty has seriously deteriorated during the past 25 years, and a rehabilitation program has been undertaken. Model tests were conducted to determine the effects of various stages of repair of the outer 1800 ft of the jetty on the hydraulic, salinity, and shoaling characteristics of the entrance area. Test results consist of tidal elevation measurements, current velocity measurements, salinity measurements, photographs of surface and bottom current patterns, and shoaling patterns. The results of the model tests indicate that complete rehabilitation of the outer end of the jetty will provide moderate benefits to the hydraulic, salinity, and shoaling characteristics of the entrance area as a whole when compared with results of tests with the outer 1400 ft of the jetty degraded to -15 ft mllw, simulating conditions which may obtain if that portion of the jetty is not rehabilitated. However, it is recommended that before the outer end of the jetty is repaired, more detailed movable-bed tests be performed to determine the optimum jetty condition. (See also W71-09341).
W71-09343

INVESTIGATION OF IN-SHORE HARBOR, SITE X. REPORT 1. DESIGN FOR OPTIMUM WAVE CONDITIONS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Wilson.
Available from the National Technical Information Service as AD-720 973, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-740. 77 p, 7 ref.

Descriptors: *Breakwaters, *Model studies, *Harbors, *Ocean waves.
Identifiers: *Hydraulic models, South China Sea, Harbor models.

The area for which the Site X harbor was proposed assumed a location in the South China Sea where an entrance channel leading into the harbor could be dredged inland approximately normal to a straight shoreline. The offshore hydrography was idealized in that the depth contours were assumed to be parallel to the shoreline and correspond to a bottom slope of 1:30. The entire inner-harbor area, approach channel, proposed protective breakwater system and wave absorbers, along with sufficient adjacent coastline and offshore hydrography necessary to the accurate simulation of storm-wave action, were reproduced in a 1:100-scale hydraulic model equipped with wave-generating and wave-height-measuring devices. The purpose of the model study was to determine the efficacy of the proposed breakwaters and companion in-harbor wave absorbers in providing adequate protection for T-1-Tanker and LST-1171 type craft berthed in the harbor during storm-wave action. It was concluded that (a) an arrowhead type of breakwater system or a parallel-jetty arrangement, with the breakwater arms so positioned as to provide a navigation entrance 420 ft wide, a 120-ft-wide, 24-ft-deep dredged navigation channel and a 24-ft-deep dredged inner-harbor basin, in combination with the proposed wave-absorber systems, would provide excellent protection against severe storm waves for the types of boats that would make use of the inner harbor, (b) adequate inner-harbor protection against storm waves would also be realized, with either a parallel-jetty or arrowhead-type breakwater system, for a 530-ft-wide navigation entrance between the outer ends of the breakwaters or jetties and with a dredged navigation channel, 120-ft-wide with a depth of 35 ft, leading into a 35-ft-deep inner-harbor basin. (See also W71-09346)
W71-09345

INVESTIGATION OF IN-SHORE HARBOR, SITE X. REPORT 2. DESIGNS OF RIPRAP COVER LAYERS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
R. A. Jackson.
Available from the National Technical Information Service as AD-720 982, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-740, Sept 1966. 43 p, 2 ref.

Descriptors: *Breakwaters, *Harbors, *Model studies, *Ocean waves, Riprap.
Identifiers: *Hydraulic models, South China Sea.

Two series of stability tests on riprap cover layers were conducted in a 2-ft-wide wave flume using a 1:15-scale model. In the first series, riprap cover layers on composite beach slopes of 1:30 and 1:8 were investigated. These slopes reproduced the natural beach slopes on each side of the entrance channel dredged from deep water to the in-shore harbor. In the second series of tests, riprap cover layers on a slope of 1:5 were investigated. These cover layers were for protection of the entrance-channel side slopes from the erosive action of waves. Also, the crown elevations of the various riprap sections were determined. Stable riprap designs were developed for all sections that required riprapping. Because the larger waves broke before reaching the area of the still-water level, the size riprap required to protect the 1:30 and 1:8 beach slopes was small. The size riprap required to protect the submerged side slopes of the dredged entrance channel was found to be a function of both wave height and water depth at the crest of the submerged channel slope. For a given wave height, side slope, and specific weight of rock, the required size of riprap increases as the water depth, measured at the crest of the slope, decreases. For similar riprap sections with an unsubmerged crest, the required size of riprap is primarily a function of wave height. (See also W71-09345)
W71-09346

DESIGN FOR OPTIMUM WAVE CONDITIONS, DANA POINT HARBOR, DANA POINT, CALIFORNIA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Howard B. Wilson.
Available from the National Technical Information Service as AD-720 190, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-724, June 1966. 55 p, 9 ref.

Descriptors: *Breakwaters, *Harbors, *Model studies, *Shore protection, Ocean waves, Winds, Storms, Construction materials, California.
Identifiers: *Hydraulic models, Bathythermograph data, Water traffic, Patrol craft, Seacoast, *Dana Point Harbor, Rubble mound breakwaters, *Dana Point (Calif).

The entire Dana Point area that will be enclosed by Dana Point Harbor and sufficient adjacent coastline and offshore bathymetry to permit accurate simulation of storm-wave action were reproduced in a 1:100-scale hydraulic model equipped with wave-generating and wave-height-measuring devices. The purpose of the model study was to determine the effectiveness of the proposed breakwater system and inner-harbor basin in providing protection from storm action for pleasure craft and fishing boats berthed within the harbor. It was concluded that the proposed breakwater system, which consists of a 5500-ft-long west breakwater and a companion 2250-ft-long east breakwater with a 600-ft-wide navigation entrance at the southeast corner of the harbor, will provide the degree of protection required for small boats to berth safely in the partially enclosed inner-harbor basin. Investigation of the wave-transmission problem, concerning the degree of wave energy that can reach the inner harbor through the interstices of the proposed rubble-mound breakwaters, showed that the wave energy transmitted to the inner basins of the harbor through the outer breakwater structures is not critical. Wave energy transmitted into the fairway by overtopping of the proposed west breakwater by near-maximum storm waves, which have a low frequency of occurrence, was found to cause conditions in the fairway that would be dangerous to small craft. However, it was determined that modification of the mole slope flanking the fairway to include a berm will reduce the wave-reflecting characteristics of this structure, and thereby reduce wave action in the fairway considerably during severe storms.
W71-09347

FILLING AND EMPTYING SYSTEMS, LOWLIFT LOCKS, ARKANSAS RIVER PROJECT. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Jackson H. Ables, Jr., and B. Boyd Marden.
Available from the National Technical Information Service as AD-720 975, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-743, Nov 1966. 188 p.

Descriptors: *Dams, *Model studies, *Locks, Flow, Drainage, Arkansas River, Culverts.
Identifiers: *Hydraulic models, Filling, Hydraulic systems, Culverts.

The low-lift locks on the Arkansas River will be 110 ft wide by 670 ft long (pintle to pintle) and will have normal lifts ranging from 14 to 30 ft. There are 15 low-lift locks at which conditions are similar enough that relatively little change in the design of the lock hydraulic system will be required at the different sites. Results of tests of the hydraulic system for these projects in a 1:25-scale model are presented in this report. Two satisfactory culvert intake manifolds were developed, a 6-port type 2 intake and an 8-port type 4 intake. The original design culvert outlet manifold which discharged into the lower lock approach performed satisfactorily. Tests of 74 sidewall port arrangements resulted in the development of five port arrangements using type A or D ports considered suitable for use at the Arkansas River low-lift projects. The type A ports are 2.54 ft wide by 3.50 ft high and the type D ports are 2.54 ft wide by 4.10 ft high. At lock 2 design conditions, 20-ft lift and 17-ft submergence (base test conditions in the model study), the recommended arrangements permit the lock to be filled in 7.5 min or less with acceptable turbulence conditions in the lock chamber and maximum hawser stresses not exceeding 5 tons. The lock can be emptied in less time with lower hawser stresses.
W71-09348

SPILLWAY AND NAVIGATION CONDITIONS, HOLT LOCK AND DAM, WARRIOR RIVER, ALABAMA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. S. Melsheimer, and T. E. Murphy.

vailable from the National Technical Information ervice as AD-720 979, $3.00 in paper copy, $0.95 n microfiche. WES Technical Report No 2-745,)ct 1966. 72 p.

)escriptors: *Dams, *Model studies, *Spillways, Locks, Culverts, Flow navigation.
dentifiers: *Hydraulic models, Hydraulic systems, Alabama, Holt Dam, Warrior River.

The hydraulic model investigations reported herein ere concerned with navigation conditions in the ock approaches, performance of the spillway, the easibility of lock culvert intakes and outlets on the verside of the riverward lock wall, and flows hrough the first and second construction stage iversion channels. Tests were conducted on two nodels: a 1:80-scale general model which eproduced 4800 ft of the approach channel, the pillway, the powerhouse, the navigation lock, and 800 ft of the exit channel; and a 1:36-scale section nodel of one spillway gate bay and adjacent half ays. Navigation conditions in the upstream lock pproach were excellent. Flows from the power-ouse created a strong eddy in the downstream ock approach. This eddy could not be eliminated y a feasible plan of excavation or a system of train-ng walls. However, a rock dike installed in the ver channel intercepted the crosscurrent and esulted in acceptable navigation conditions. The apacity of the spillway was not as great as had een computed. Model tests indicated reasonable eir and pier contraction discharge coefficients but xcessive losses at the abutments and a submer-ence effect of the tailwater. The excessive losses t the abutments were reduced by modifications of ne end piers. A stilling basin was not deemed ecessary, and model tests were used to develop a oe curve which deflected the nappe away from the mmediate toe of the spillway. The feasibility of the ock culverts' intake and discharge systems was erified. The adequacy of both the first and second onstruction stage diversion schemes was stablished.
W71-09349

NAVIGATION CONDITIONS AT LOCK AND DAM NO 4, ARKANSAS RIVER. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, and Cody D. McKellar.
Available from the National Technical Information Service as AD-720 984, $3.00 in paper copy, $0.95 n microfiche. WES Technical Report No 2-746, Oct 1966. 84 p.

Descriptors: *Dams, *Locks, *Model studies, Navigation, Inland waterways, River flow.
Identifiers: *Hydraulic models, River currents, Arkansas River, Rob Roy Bridge.

Lock and Dam No 4 will consist of a 110- by 600-ft ock and a 1190-ft-long, gated, nonnavigable dam. A 1:120-scale, fixed-bed model, reproducing 5.2 miles of the Arkansas River, was used to: (a) demonstrate flow conditions in lock approaches nd in vicinity of Rob Roy Bridge (1.3 miles above ock); (b) determine effect of various guard wall esigns on forces affecting tows in upper lock ap-roach; (c) determine optimum location of harbor nd dock, and mooring facilities; (d) measure dis-ribution of different flows throughout the model; nd (e) furnish information for use in developing nodifications of the approaches and structures to mprove navigation conditions. Tests were con-erned with study of flow patterns, measurement of elocities in lock approaches, and behavior of a nodel tow on entering and leaving the locks and avigating through Rob Roy Bridge under flows anging from 100,000 to 350,000 cfs. Test results ndicated: (a) location of lock and dam with espect to Rob Roy Bridge was satisfactory; (b) ock upper guard wall (riverside) instead of a guide vall should be used to provide satisfactory naviga-ion conditions. Port capacity of the guard wall hould be sufficient to eliminate hazardous cross-currents; (c) harbor and dock facilities should be ufficiently far upstream of lock to eliminate their effects on navigation approaching the lock; (d) navigation through existing Rob Roy Bridge swing span might be hazardous during high flows because of high velocities and limited bridge opening. Removal of a point along right bank at bridge would reduce velocities without affecting navigation conditions downstream of bridge; (e) navigation conditions in lower approach should be satisfactory.
W71-09350

FILLING AND EMPTYING SYSTEMS, MILLERS FERRY AND JONES BLUFF LOCKS, ALABAMA RIVER, ALABAMA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Jackson H. Ables, Jr., and Marden B. Boyd.
Available from the National Technical Information Service as AD-720 192, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-718, Mar 1966. 116 p.

Descriptors: *Dams, *Model studies, *Flow, Drainage, Test procedures, Alabama.
Identifiers: *Hydraulic models, Hydraulic systems, Filling.

Filling and emptying systems for the 600- by 84-ft Millers Ferry (48-ft lift) and Jones Bluff (45-ft lift) Locks will comprise two intake ports in the river side of the upper gate block, 10-ft-square culverts in each wall, a lateral crossover culvert at the midpoint of the lock leading to four longitudinal floor culverts with side ports, and culvert outlets which empty riverward of the lock in the common outlet basin. Reverse-mounted tainter valves control flow in the system. The hydraulic system was tested in a 1:25-scale model. Original design intakes and outlets performed satisfactorily. The major portion of the study was devoted to developmental tests of a new type of filling system, the longitudinal floor culvert system. Two systems were developed, one to conform to site restrictions at the Millers Ferry project and a second for use at the Jones Bluff project where no space limitations are placed on the system. Pressures were satisfactory except just downstream from the filling valves; pressures recorded in these areas may result in cavitation. Admission of small controlled quantities of air just downstream of the valves should cushion the collapse of vapor pockets and minimize possible damage without adversely affecting performance of the system. With the adopted hydraulic system installed in the model, hawser stresses on 6and 12-barge tows were well within the 5-ton limit during operations with normal heads and 14-ft submergence. The longitudinal floor culvert systems investigated exhibited several favorable characteristics which suggest that these systems may be used effectively in larger and higher-lift locks. However, much additional developmental work is needed prior to the use of such a system at projects with larger locks or significantly higher lifts.
W71-09351

FILLING AND EMPTYING SYSTEM, CORDELL HULL NAVIGATION LOCK, CUMBERLAND RIVER, TENNESSEE. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Noel R. Oswalt, and Marden B. Boyd.
Available from the National Technical Information Service as AD-720 977, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-739, Sept 1966. 89 p.

Descriptors: *Dams, *Model studies, *Drainage, *Locks, Flow, Tennessee.
Identifiers: Hydraulic models, Filling, Hydraulic systems, Mechanical drawings, Cordell Hull Dam, Cumberland River.

Cordell Hull Lock will be 84 ft wide by 450 ft long and will have a normal lift of 59 ft with a maximum lift of 62 ft occurring about 5 percent of the time. Model study (scale 1:25) of the filling and emptying system proposed for this lock was confined to the portion of the hydraulic system between the filling and emptying valves. Performance of the type 1 (original) multiport arrangement was, in general, satisfactory even though it was evident from test results that certain improvements could be made in the system. The lock chamber manifold includes three horizontal rows of seventy-two 8-in.-diam ports resulting in an overall port area/culvert area ratio of 0.75 based on the culvert area at the valves. The manifold extends over 48 percent of the chamber length and is centered about 3.9 percent of the chamber length upstream from the midpoint of the chamber. The ports discharge into a 3-ft-wide by 6.5-ft-deep trench along the toe of the lock wall. With the proposed filling-emptying system the lock can be filled in 11.0 min (4-min valve) and emptied in 11.2 min (1.5-min valve) with acceptable hawser stresses and turbulence conditions in the chamber. Consideration of the performance of the system and construction schedules at the project resulted in its adoption for use at the Cordell Hull project. However, additional tests of the multiport system were conducted since this type of system was under consideration for use at another project. These tests resulted in several suggestions for improvements in the system. Port arrangements in which conventional sidewall ports discharged into a trench at the toe of the lock wall were also investigated, but their performance did not compare favorably with that of the better multiport arrangements.
W71-09352

CULVERT PRESSURES, GREENUP LOCK, OHIO RIVER, KENTUCKY. HYDRAULIC PROTOTYPE TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Peter M. Smith, and Ronald A. Yates.
Available from the National Technical Information Service as AD-720 544, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-734, July 1966. 45 p.

Descriptors: *Dams, *Model studies, *Locks, *Test procedures, Drainage, Hydrostatic pressure, Kentucky, Culverts.
Identifiers: *Hydraulic models, Filling, Test facilities, Greenup Dam.

Prototype tests were conducted at Greenup Lock to investigate pressures in the filling and emptying systems of the main lock and water-surface elevations in the lock chamber. Continuous measurements were made with valve opening and closing periods of 4 and 8 min for conditions of two-culvert (normal) operation, single-culvert operation, and steady flow. The steady-flow tests yielded data concerning head loss coefficients through the lock manifolds and laterals. Discharge coefficients for two-culvert operation were also obtained. These data were compared with results obtained from the hydraulic model study. Dissimilarities between model and prototype results are thought to be largely due to dissimilarities between model and prototype designs. However the test results are believed to substantiate the validity of the model.
W71-09353

DROP STRUCTURES FOR WALNUT CREEK PROJECT, WALNUT CREEK, CALIFORNIA. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. A. Pickering.
Available from the National Technical Information Service as AD-720 187, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-730, June 1966. 57 p, 3 ref.

Descriptors: *Dams, *Model studies, *Stilling basins, *Flow, Riprap, Test procedures.
Identifiers: *Hydraulic models, Walnut Creek (Calif).

Walnut Creek project will provide for enlargement and rectification of the existing channels of Walnut, Lower San Ramon, and Las Trampas Creeks. Three grade control structures and one energy dissipating structure will be used to reduce velocities and dissipate excessive energy from flood flows. Model investigations were conducted on 1:20-scale models of drop structures 2 and 3. Tests were concerned with determining the optimum size and configuration of the stilling basins for these structures, the stability of the riprap downstream from the stilling basins, and the adequacy of the inlet transition upstream from dropstructure 2. Tests revealed that flow conditions produced by the original design stilling basins of both structures were unsatisfactory. Several modifications to drop structure 2 were tested in an effort to reduce the high velocities and surface waves that occurred in the exit channel with the original design. A stilling basin that resulted in satisfactory flow conditions with the design discharge was developed. The riprap requirements in the exit channel downstream from the stilling basin were determined. Flow conditions through the inlet transition upstream from drop structure 2 were satisfactory for all discharges tested.
W71-09354

REDUCTION OF SHOALING IN CHARLESTON HARBOR AND NAVIGATION IMPROVEMENT OF COOPER RIVER, SOUTH CAROLINA HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
William H. Bobb, and Henry B. Simmons.
Available from the National Technical Information Service as AD-720 193, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-733, July 1966. 166 p.

Descriptors: *Harbors, *Model studies, *Shoals, *Inland waterways, Salinity, Test procedures, Sedimentation, Tides, South Carolina.
Identifiers: *Hydraulic models, River currents, Cooper River, Wando River, Charleston Harbor, Cooper River, South Carolina.

The existing comprehensive fixed-bed model of the Charleston Harbor system was used to conduct several special-purpose studies. These studies involved a proposed silt trap in Wando River, salinity investigations, a proposed spoil area dike, a scheme to redivert powerhouse discharge from Cooper River into Wando River, intermittent powerhouse operation to meet peak demands, and a proposed extension of the existing navigation channel in Cooper River. In general, model tests were conducted to determine the effects of the several proposals on tides, currents, and salinities throughout the estuary, and test results consist primarily of measurements of tide heights, current velocities, salinities, time-exposure photographs of surface current patterns, graphic illustrations of dye dispersion, and analyses to determine flow predominance.
W71-09355

SPILLWAY AND OUTLET WORKS, SHELBYVILLE DAM, KASKASKIA RIVER, ILLINOIS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Don R. Bucci, and John L. Grace, Jr.
Available from the National Technical Information Service as AD-720 186, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-719, June 1966. 131 p.

Descriptors: *Dams, *Model studies, *Spillways, *Stilling basins, Outlet works, Test procedures, Flow, Construction materials, Hydrostatic pressure, Illinois.
Identifiers: *Hydraulic models, Shelbyville Dam, Kaskaskia River (Ill).

Tests were conducted on a 1:40-scale model reproducing the spillway for Shelbyville Dam, a combination concrete and earth structure rising 108 ft above the bed of the Kaskaskia River. The spillway consists of an ogee crest controlled by three tainter gates 45.33 ft wide and 36.92 ft high; a 156-ft-2ide, 206-ft-long chute sloped 1 on 4; and a conventional hydraulic jump type stilling basin. The design flood, 162,500 cfs, will be passed at pool elevation 638.2 by combined operation: 157,500 cfs over the spillway and 5000 cfs through two 11-ft-high by 5.5-ft-wide sluices through the spillway section beneath the piers. Flow conditions in the approach, discharge characteristics of the spillway, hydrostatic pressures on the ogee weir crest, performance of the conventional stilling basin, and the height of the training walls were investigated. The limits of two exit channel protection plans involving the use of various sizes and gradations of stone and concrete paving were developed with and without berms behind the training walls. Surging at the abutments was minimized and weir capacity was increased by the use of rock dikes near the abutments. The spillway rating curve determined by the model was inadequate, yet reasonably compatible with the theoretical rating curve; and the combined capacity of the adopted spillway and sluices was adequate. Heads greater than the design head created negative pressures on the weir crest as expected; however, cavitation was not indicated. Satisfactory energy dissipation was obtained with a 125-ft-long horizontal stilling basin at the elevation dictated by foundation conditions (513.0) surmounted by two rows of 10-ft-high baffle piers and terminated by a 5-ft-high vertical-faced end sill. The model indicated that the height of the stilling basin training walls could be reduced 5 ft.
W71-09357

NAVIGATION CONDITIONS AT BELLEVILLE LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, and Louis J. Shows.
Available from the National Technical Information Service as AD-720 549, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-738, Sept 1966. 56 p.

Descriptors: *Dams, *Model studies, *Flow, *River flow, Navigation, Sites, Test procedures, West Virginia, Ohio, Locks, Canals.
Identifiers: *Hydraulic models, Site selection, Belleville Dam, Ohio River.

Belleville Locks and Dam, designed to maintain during low flows a single upper pool extending upstream 41.7 miles, will replace Locks and Dams Nos. 18, 19, and 20 of the present Ohio River navigation system. The dam will consist of a non-navigable gated structure 892 ft long with a damming height of 32 ft, and a 265-ft-long, fixed-crest weir connecting the gated spillway with the left bank. The locks, on the right bank, are to be of the high-lift type (ultimate 22 ft) consisting of two parallel chambers having clear dimensions of 110 by 1200 ft and 110 by 600 ft. An undistorted 1:120-scale, fixed-bed model, reproducing approximately 3.1 miles of the Ohio River and the lock and dam structures, was used to study the adequacy of the proposed design, to determine the best location for the locks under various flow conditions, and to develop measures to overcome or minimize the effects of any adverse conditions noted. The results of the investigation indicated that, because of the alignment of currents, the locks and dam should be shifted to the right as far as practicable to improve navigation conditions in the upper lock approach and flow distribution through the dam. The swell-head through the structures during medium flows could be reduced by increasing the number of dam gates from seven to eight. Velocities in the upper approach will tend to be high, but can be reduced by the use of submerged dikes.
W71-09360

STEADY-FLOW STABILITY TESTS OF NAVIGATION OPENING STRUCTURES, HILO HARBOR, TSUNAMI BARRIER, HILO, HAWAII, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Noel R. Oswalt, and Marden B. Boyd.
Available from the National Technical Information Service as AD-720 981, $3.00 in paper copy, $0.95 in microfiche. WES Technical Report 2-742, Oct 1966. 17 p, 16 photos, 14 plates.

Descriptors: *Breakwaters, *Model studies, *Harbors, Ocean waves, Hawaii, Tsunamis.
Identifiers: *Hydraulic models, Hilo Harbor (Hawaii).

Steady-flow tests of navigation opening structures in the Hilo Harbor tsunami barrier were conducted to determine the effect of tsunami-induced high-velocity currents through the navigation opening on stability of the barrier heads. Tests were conducted in a 1:60-scale model which reproduced one-half of the navigation opening and a 1:72-scale model which reproduced the full opening. Steady flow through the opening with a head differential of 28 ft across the barrier was the basic test flow, representing the peak flow condition caused by the design tsunami. Tests were designed to determine the cover-stone size required on the barrier heads for stability under this steady-flow condition and also to investigate methods for providing toe protection for barrier heads constructed on sand. Results of the steady-flow tests were to be correlated with results of model tests concerned with wave action and with other factors to develop the optimum design of the tsunami barrier. Steady-flow test results indicated that the barrier head cover-stone size needed for stability under steady flow was considerably smaller than that needed for stability against wave action. Test results also showed that the only reliable method of obtaining stable barrier heads was to construct them on a rock foundation. If conditions made this impractical, a protective blanket of stone covering the entire channel bottom through the navigation opening was recommended to protect the toe of the barrier heads. Additional stone placed around the toe of the barrier to 'armor' the toe as sand scoured away was not recommended unless the depth of sand at the site was shallow and unless repair and maintenance operations could be performed after each tsunami until the currents removed all sand, leaving the barrier heads resting on rock.
W71-09361

8C. Hydraulic Machinery

TESTING AND EVALUATION OF OIL SPILL RECOVERY EQUIPMENT.
Main Port Authority, Portland.
For primary bibliographic entry see Field 05G.
W71-08942

Lake Powell Quality Studies for the Navajo Plant,
Bechtel Inc., San Francisco, Calif; and Arizona State Univ., Tempe.
For primary bibliographic entry see Field 05C.
W71-09051

TURBINE-DISCHARGE MEASUREMENTS BY CABLE-SUSPENDED CURRENT METERS,
Corps of Engineers, Omaha, Nebr. Missouri River Div.
G. N. Lathrop, and R. A. Singleton.
Paper, Corps of Engineers, Missouri River Division, Reservoir Control Center, Omaha, Nebr, Dec 1970. 32 p, 23 fig, 1 ref, 2 append.

Descriptors: *Discharge measurement, *Hydraulic turbines, *Current meters, *Water measurement, Discharge (Water), Flow measurement, Flow, Flow around objects, Errors, Turbulent flow, Analysis, Instrumentation, Electronic equipment,

odel tests, Laboratory tests, Reproducibility, mputer applications, Accuracy, Reliability.

method of using cable-suspended current meters r measuring discharges in the intake passages of draulic turbines was developed by the Corps of gineers. The procedure is used in plants with in- ke passages changing cross section leading rectly into the scroll case without a penstock. The ble suspension system reduces distortion of the w because the slender cables on which the cur- nt meters are mounted are too far apart to cause cumulative effect. The apparatus used and the ethods of making measurements are described d compared with rigid-frame-type installations d measurements. Results obtained from the ble-suspended method of turbine-discharge mea- rement have been successful with an accuracy of easurement within 2%, meeting all requirements most acceptable codes. (USBR)
71-09052

PPLICATION OF DIMENSIONAL ANALYSIS D FLASHOVER CHARACTERISTICS OF POL- UTED INSULATORS,
ectricity Corp., Cairo (Egypt).
A. M. Ritk.
oceeding Institution of Electrical Engineers ngl), Vol 117, No 12, p 2257-2260, Dec 1970. 4 18 ref.

scriptors: *Flashover, Contamination, *Electri- insulators, Field investigations, Direct current, ternating current, Bibliographies, Air pollution, imensional analysis, Laboratory tests, Transmis- n lines, *Electric arcs, Electric fields, Leakage rrent, Performance, Foreign research, Charac- istics, Investigations.
ntifiers: United Arab Republic, Contaminants.

e method of dimensional analysis is applied to termine flashover characteristics of polluted in- ators. Expressions deduced for flashover volt- es in a d-c circuit under simplified conditions ree with previous analytical findings. The work is ended to flashover characteristics in a-c systems ere the dynamic properties of arcs are in- duced. The same functional dependence of shover voltages on pollution and insulator aracteristics prevails as for d-c conditions, hough magnitudes of the flashover voltages may different in the 2 cases. An expression for the ocity of arc propagation along polluted insulator faces is deduced with due consideration of insu- or, layer, and circuit parameters. Of special in- est are the dependence of the ultimate arc ocity on the short-circuit current of the test cir- t and the expression for minimum voltage neces- y to start arc motion. Whenever possible, the alyses are compared with previous field and oratory experiences. (USBR)
71-09062

DIOISOTOPES AND TURBINE FLOW MEA- REMENTS,
reau of Reclamation, Denver, Colo.
r primary bibliographic entry see Field 07B.
71-09066

FECT OF HYDROTURBINE OPERATING NDITIONS ON THE INTENSITY OF VITATION EROSION,
ningrad Metal Works (USSR).
l. Pylaev, A. A. Sotnikov, and A. M. Livshits.
r Reclam Transl 846, Jan, 1971. 23 p, 5 fig, 3 , 2 append. Energomashinostr, No 1, p 30-33, 70.

scriptors: *Hydraulic turbines, Model tests, ncis turbines, High head, *Fluid flow, Kaplan bines, Cavitation control, Materials tests, avitation, Cavities, Stainless steel, Accelerated sion, *Cavitation index, *Turbine blades, locity, Laboratory tests, Submergence, Turbine iciency, Vortices, Pitting, Foreign design prac- es, Damages.

Identifiers: USSR, *Cavitation parameters, Baksansk Powerplant, USSR, Stroboscopic lighting, Bratsk Powerplant, USSR.

Results of experiments on laboratory test stands and prototype turbines show that operating conditions play a large part in the development of cavitation erosion. Stroboscopic observation of flow in models shows that vapor cavities form on blades of turbines before the onset of the disruption of efficiency. Two types of cavitation are discussed: one type forms from separate vapor bubbles which join into a bubble of significant size, and the other forms from pulsating vapor cavities varying in frequency. The use of cavitation-resistant stainless steel did not eliminate cavitation damage in many cases. In test models, the method of accelerated erosion was used to simplify the determination of damage. The cited measures for selected operating conditions, unit submergence, and blade design are recommended to meet the requirements of cavitation-free operation, and will not necessarily lead to a decrease in turbine efficiency. Laboratory tests and field observations were conducted on Kaplan and Francis runner blades, including Bratsk and the Krasnoiarsk prototype installed at Baksansk Hydropowerplant. (USBR)
W71-09070

8D. Soil Mechanics

THE ENGINEERING PROPERTIES OF MINE TAILINGS,
Bureau of Mines, Spokane, Wash.
For primary bibliographic entry see Field 08G.
W71-09053

SAFETY FACTORS IN SOIL MECHANICS,
Nova Scotia Technical Coll., Halifax.
G. G. Meyerhof.
Canadian Geotechnical Journal, Vol 7, No 4, p 349-355, Nov 1970. 7 p, 2 fig, 2 tab, 27 ref.

Descriptors: *Safety factors, *Soil mechanics, Probability, Stability analysis, *Earthworks, Earth dams, *Foundations, Variability, Retaining walls, Soil properties, Risks, Loads (Forces), Bibliographies, Failure (Mechanics), Safety, Sliding resistance, Foreign research.
Identifiers: Canada.

The safety margin in earthwork and foundation engineering is considered in relation to soil exploration and tests, analysis of stability under applied loads, and construction and operation of the structure during service life. Customary overall and suggested partial safety factors used in stability analyses are governed mainly by the variability and uncertainty of assessment of soil resistance, the variability of applied loads, approximations in stability analyses, and the seriousness of a failure. On the basis of probability concepts of safety, the conventional overall safety factors used in earthwork and foundation engineering analyses are related to approximate probabilities of stability failure and to a range of overall coefficients of variation. Safety analysis of earthworks indicates that customary overall safety factors for large earth-retaining structures and foundations are fairly adequate, and that unless careful performance observations are made during and after construction, earth dams should be designed for a minimum overall safety factor of about 1.7 (USBR)
W71-09061

STUDIES OF INTER-PARTICLE VOID CHARACTERISTICS,
Geoffrey Lees.
Quarterly Journal of Engineering, Vol 2, No 4, p 287-299, May 27, 1970. 13 p, 4 fig, 3 plate, 4 tab, 18 ref, append.

Descriptors: *Pores, *Porous media, *Voids, *Interstices, Particle shape, Particle size, Aggregates, Graded.

A method is described for studying characteristics of the voids contained within a mass of aggregate particles. Measurements were made on void cells dissected from single size aggregate systems of a variety of particle shapes in dense and loose packings. The measurements refer to the critical ratio of occupation and the critical ratio of entrance. From these measurements occupation size distribution curves and entrance size distribution curves can be drawn, analogous to particle size distribution curves. The results may be applied to the problem of the design of aggregate gradings to minimum or controlled void content, using premixing or filtration techniques, and to the related problem of segregation of mixed aggregates. (Knapp-USGS)
W71-09082

CONSOLIDATION CHARACTERISTICS OF SOME PLEISTOCENE PERIGLACIAL METASTABLE SOILS OF EAST KENT,
Imperial Coll. of Science and Techology, London (England). Dept. of Geology.
For primary bibliographic entry see Field 02G.
W71-09140

SOIL-CEMENT SEEPAGE TEST SECTION LUBBOCK REGULATING RESERVOIR CANADIAN RIVER PROJECT, TEXAS,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
Glenn DeGroot.
Available from the National Technical Information Service as PB-198 136, $3.00 in paper copy, $0.95 in microfiche. Bur Reclam Rep REC-ERC-71-13, Feb 1971. 43 p, 40 fig, 4 tab, 2 ref, append.

Descriptors: *Soil cement, *Seepage, *Permeability, Cracks, Reservoirs, Hydraulic gradient, Texas, Reservoir leakage.
Identifiers: *Field tests, Thermal expansion, *Permeability tests, Seepage losses, Canadian River Project (Tex), Lubbock Regulating Rsvr (Tex).

A large-scale seepage test was performed on sections of soil-cement facing at Lubbock Regulating Reservoir in Texas. Two collection systems each covering about 1200 sq ft were built into the earth lining before the facing was constructed. Each collection system consisted of a butyl rubber sheet and sand blanket with a drainage pipe to collect the water and take it to a measurement tank. Seepage rates at unit gradient varied from 0.15 cu ft/sq ft/day at the beginning of the test to 0.002 cu ft/sq ft/day during the warmer months in 1968 to 1970. Rates increased to about 0.04 cu ft/sq ft/day during the colder months. Possible reasons for the decrease in seepage rates during the warmer months are: (1) closing of the shrinkage cracks; (2) algal growth in the cracks; and (3) temperature variation in the facing. A laboratory permeability test showed a considerably lower coefficient of permeability, indicating the most of the seepage in the test section was occurring along the cracks.
W71-09266

MEASUREMENTS OF THE ENGINEERING PROPERTIES OF MARINE SEDIMENTS,
Naval Academy, Annapolis, Md. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 02J.
W71-09291

THE SEAFLOOR EXCAVATOR, VOLUME IV. APPENDICES,
Northrop Corp., Anaheim, Calif. Electro-Mechanical Div.
C. P. Buckley, F. S. Coxe, and O. Shev.
Available from the National Technical Information Service as AD-720 344, $3.00 in paper copy, $0.95 in microfiche. Naval Civil Engineering Laboratory Report CR-71.003, Dec 1970.

Descriptors: *Beds under water, *Oceans, *Earth-handling equipment, Structural properties, Soil mechanics, Mathematical models, *Dredging.

Identifiers: *Ocean bottom, Underwater vehicles, Deep submergence, Removal, Underwater equipment, Environmental tests, *Seafloor excavators, Underwater excavation, Underwater construction.

The system definition and analysis process through which a deep-ocean Seafloor Excavator is developed is described. Eight concepts are initially formulated and studied, with the three most practical being further developed. A comprehensive system and cost analysis of the three selected concepts is performed to determine the single, most effective concept. The preliminary design and the design specifications for this concept are developed. The resulting design is of a wide-tracked, remotely operated submersible vehicle equipped with a revolving, extendable (jackknife) dredging arm capable of performing earthmoving, excavating dredging tasks in waters as deep as 6000 feet. This report is comprised of four volumes: Volume I contains the summary, Volume II contains the preliminary design and specifications, Volume III contains the concept definition and system analysis studies conducted to establish the preliminary design requirements, and Volume IV contains supporting and supplemental data developed during the course of this program.
W71-09358

8E. Rock Mechanics and Geology

DEFORMATION OF ROCK FOUNDATIONS OF HIGH DAMS AFTER FILLING THE RESERVOIRS,
R. R. Tizdel.
Hydrotechnical Construction, No 6, p 512-519, June 1970. 8 p, 7 fig, 13 ref.

Descriptors: Dams, *Concrete dams, Rock foundations, *Dam foundations, *Deformation, Loads (Forces), Dam design, Large structures, Dam failure, Reservoir storage, Cracking, Cutoffs, Stress, Strain, Reservoirs, Settlement (Structural), Foreign research.
Identifiers: USSR.

Deep reservoirs formed by high dams and storing large amounts of water cause deformations in the rock masses making up the bottom and sides of the basins. The deformations, which depend on the water load and on the dimensions of the surfaces over which the load is distributed, alter the stress in the rocks to a considerable depth. The deformations extend beyond the perimeter of the reservoirs, forming broad depressions. Under these conditions, the dam is situated on the edge of the depression thus formed, with the foundation sloping toward the upper pool. In the case of high concrete dams, this may result in tensile stresses in the base in contact with the rock and in the section of the foundation near the contact, which may cause partial destruction of the contact, opening of cracks in the foundation, and fracture of the cutoff. Several examples of the effect of the weight of reservoir water on the deformation of dam foundations are discussed. (USBR)
W71-09060

UNDERGROUND ROCK STRUCTURES CHALLENGE THE ENGINEER,
Leeds, Hill and Jewett, Inc., San Francisco, Calif.
T. A. Lang.
Paper American Society of Civil Engineers National Water Resources Engineers, Phoenix, Ariz, Jan 1971. 20 p, 3 fig, 5 ref.

Descriptors: Rock excavation, *Rock foundations, Rock mechanics, *Rock properties, *Rock tests, Underground powerplants, Finite element method, Tunnel construction, *Tunnel design, Foundations, In situ tests, In situ rock, Foundation investigations, Laboratory tests, Mines, Computer applications, Elastic theory.
Identifiers: Bureau of Mines, Bureau of reclamation, Malpasset Dam, France.

Rock mechanics and engineering for rock construction have come a long way from being a qualitative art, and the design and construction of rock structures such as large excavations--either surface or underground--present a real challenge to the engineer. Techniques for investigating and determining within acceptable tolerances the rock conditions at a site are available, and reasonable analytical procedures have been developed. The engineer must correlate and meld the techniques and analytical procedures so that designs prepared for major engineering structures will ensure permanent stability and adequacy under specified conditions of usage. (USBR)
W71-09065

8F. Concrete

STRENGTH VS STRUCTURE: A STUDY FOR HYDRAULIC CEMENTS,
Carnegie-Mellon Univ., Pittsburgh, Pa.
E. M. Krokosky.
Materials and Structures, Vol 3, No 17, p 313-323, Sept-Oct 1970. 11 p, 19 fig, 1 tab, 21 ref.

Descriptors: *Molecular structure, *Concretes, Cements, Theory, Voids, Compressive strength, Bonding strength, *Concrete technology, Silicates, Tensile strength, Strength, *Electron microscopy, Capillarity, Porosity, *Portland cements, Water content, Water-Cement ratio, Bibliographies.
Identifiers: Hydraulic cement, Cement chemistry, Cement hydration, Cement paste.

A review of the present state-of-the-art in structure versus strength determinations for hydraulic cements is undertaken. Morphological and mechanical factors are discussed. New electron micrograph studies of the hydrated material at 800 kv are presented. Evidence shows that hydrated portland cement is potentially a very strong material. All data suggest that primary bond exists between the aggregations of hydrated material, but the existence of primary bonds is not consistent with the structure of hydrated material as presented in the literature. By using 1000-kv electron microscopes and microscan equipment, substantial breakthroughs will be made in the structure observation field. The mechanical testing field seems adequate in most respects. If the hydrated system consists primarily of strong primary bonds, some innovating thinking must be done to explain the nature of the strength of interactive bonds that could develop when these masses of hydrating material interact and interlock. (USBR)
W71-09063

CONTRIBUTION TO THE DETERMINATION OF THE SAFETY COEFFICIENT OF CONCRETE,
J. F. Orth.
Transl from French Bur Reclam Transl 725, Feb, 1971. 17 p, 9 fig, 18 ref. Schweizer Bauzeitung, Vol 88, No 43, p 965-970, Oct, 1970.

Descriptors: Concretes, Concrete properties, *Concrete tests, *Safety factors, *Concrete technology, Coefficients, Design, Criteria, Crushing, Compression tests, Structural behavior, Dams, Stress, Strain, Laboratory tests, Foreign research, Bibliographies.
Identifiers: *Microfissuration, Breaking strength.

The engineer responsible for designing a structure is faced with the dilemma of reconciling the economy and safety of the structure so that it may be economically profitable and at the same time satisfy the strictest stability guarantees. Nothing must be neglected to ensure the greatest possible safety in the design. Questions arise as to whether traditional concrete compression and tension tests are sufficient and still guarantee the allowed degree of safety, and whether stresses less than those occurring at the breaking point cause a predislocation of the most strained parts. R Peltier and H Ruesch observed that concrete cannot be strained without damage beyond a certain stress. This stress is smaller than the breaking point stress obtained by traditional tests. Therefore, the safety of a large concrete structure should not be evaluated on the basis of traditional tests but rather the strength corresponding to the microfissuration threshold. When the safety coefficient based on the microfissuration threshold is analyzed in comparison with the traditional coefficient, it is undeniable that the microfissuration threshold is based on superior experimental notions; the safety margin is narrower but more realistic. (USBR)
W71-09067

CONCRETE-POLYMER MATERIALS--THIRD TOPICAL REPORT,
Bureau of Reclamation, Denver, Colo.
J. T. Dikeou.
Bureau of Reclamation Report REC-ERC-71-6 and Brookhaven National Laboratory Report BNL 50275 (T-602), Jan 1971. 107 p, 49 fig, 52 tab, 10 ref.

Descriptors: Concrete mixes, Concrete pipes, Concrete tests, *Concrete technology, Impregnation, Research and development, Durability, *Polymer concretes, Materials engineering, Construction materials, Desalination plants, Composite materials, Polymers, Monomers, Concretes, Structural concrete, Concrete properties, Concrete products.
Identifiers: *Concrete-polymer materials, Concrete vessels.

Investigations of concrete-polymer materials as of June 1970 by a joint program of the Bureau of Reclamation, Brookhaven National Laboratory, Atomic Energy Commission, and Office of Saline Water are reported. Three materials being investigated are: (1) polymer-impregnated concrete (PIC - precast portland cement concrete impregnated by a monomer system which is subsequently polymerized in situ); (2) polymer-cement concrete (PCC - monomer is added during mixing of portland cement, water, and aggregate followed by polymerization); and (3) polymer concrete (PC - a composite formed by polymerizing a monomer and aggregate mixture). Investigations indicate that the most successful concrete polymer material for construction is PIC, but present studies are including PC and PCC because of potential applications if feasible fabrication methods can be developed. Compared to conventional concrete, PIC shows impressive improvements in strength and durability. Tests show that PIC made with ordinary concrete has essentially the same properties as PIC made with a more expensive high-strength concrete. Applications for PIC being investigated are desalting plants, drain tile, culvert and sewer pipe, beams and wall panels in housing, bridge decks, roads, luminaries, and underwater structures. (USBR)
W71-09072

8G. Materials

THE ENGINEERING PROPERTIES OF MINE TAILINGS,
Bureau of Mines, Spokane, Wash.
H. C. Pettibone, and C. D. Kealy.
Paper, American Society of Civil Engineers, National Water Resources Engineering Phoenix, Ariz, Jan 1971. 27 p, 16 fig, 6 tab, 10 ref, append.

Descriptors: Mine wastes, *Construction materials, Highways, Physical properties, Earth dams, Environmental effects, Workability, Embankments, Gradation, Pervious soils, Cohesionless soils, Shear strength, Relative density, Stress-strain curves, Soil properties, Earth materials, Soil investigations, Soil mechanics, *Properties, Materials engineering.
Identifiers: *Tailings.

Because of more and more emphasis on the quality of our environment, consideration of using waste materials such as mine tailings instead of creating

new borrow pits for construction of highways and earth dams is becoming imperative. Some important engineering properties of mine tailings related to using the material for construction are presented. Mine tailings are manmade materials and have more uniform characteristics than most natural deposits. The desired gradation of materials from tailings can be obtained by using hydraulic cyclones or by selective excavation from tailings ponds. Mine tailings contain more minus No. 200 particles than might be expected for a good construction material; however, because of the particle shape and lack of colloidal particles, the material can contain more fines than normal and still be free draining and easily workable. Most mine tailings are cohesionless, compact easily, and have good shear strength. Sources of tailings can be found within economic haul distance of many construction sites. An example showing that mine tailings have been used successfully for a highway embankment, and a hypothetical case showing that tailings could be used to construct earth dams are presented. (USBR)
W71-09053

FRP: CORROSION'S LATEST ENEMY,
H. R. Clauser.
Iron Age, Vol 206, No 16, p 81-88, Oct 1970. 8 p, 6 fig, 2 tab.

Descriptors: Corrosion resistance, Electronic equipment, Nylon, Boats, Thermoplastic resins, Reinforced plastics, Tensile strength, Mechanical properties, *Reinforced plastic pipe, Research and development, *Pipes, *Plastics, Epoxy resins, Glass fibers, Electrical properties, Polyvinyl alcohol, *Glass reinforced plastics, Dies, Aircraft, Polyester resins.
Identifiers: Fiberglass plastic pipes, Automobile industry.

The use of fiber reinforced plastics (FRP) will increase at a faster pace than any other engineering material. Over the 3-year period, 1966-69, FRP output jumped an average of 27% per year, bringing the total value of molded FRP products up to about $650 million in 1969. Reasons for the past production boom in FRP are many, including: (1) extremely versatile composites, (2) lightweight with relatively high strength-to-weight ratios, and (3) excellent corrosion resistance. In addition, FRP can be economically formed into virtually any shape and size part. Altogether, about 35,000 different parts are being made in reinforced plastics. Presently, 22% of the total FRP production goes to the automobile industry; by 1975, use by this industry is expected to triple. Growth has been spectacular in the marine field; FRP now dominates construction of hulls from 14 to 50 ft in length. In commercial and private aircraft fields, fiber reinforced plastics are making steady gains. Pipe, probably the fastest growing segment of the market, is produced by continuous machine processes, and the resin and reinforcement can be tailored to meet specific service conditions. The applications of reinforced plastics are definitely in areas traditionally held by metals. (USBR)
W71-09057

8H. Rapid Excavation

THE TEST BORING OF WOHLMEYER TYPE 3.0 M DIAMETER TUNNEL BORING MACHINE (TBM-840),
M. Muta, and S. Fujimoto.
IHI Engineering Review, Vol 3, No 5, p 84-90, Sept 1970. 7 p, 12 fig, 1 tab.

Descriptors: *Boring machines, *Field tests, Test procedures, Tunnels, Rock excavation, Tunnel construction, Tunneling, Specifications, Curves, *Tunneling machines, Construction equipment, Performance, Construction methods, Boring.

Tests of a Wohlmeyer Boring Machine (TBM-840) designed to bore a 4-m-dia investigation tunnel through andesite were made to determine the capabilities of the machine and to develop methods for boring a double tunnel, S-shaped siding. Tests were conducted in hard, abrasive rhyolite. Specifications of the machine, rock properties and geology at the test site, and test procedures are presented. The first test was to bore a straight tunnel 4 m in diameter and 50 m long while measuring boring rate, cutter power, drum torque, and cutting thrust. Average speed of the boring was 0.55 m per hr, considered satisfactory in hard rhyolite. The second test was to bore a double tunnel, S-shaped siding with a radius of curvature of 150 m. The double section was advanced by boring two 4-m-dia overlapping tunnels with an eccentricity of 2 m. The boring machine could be steered nearly in accordance with the planned line. Conclusions are: (1) boring of double tunnels with the machine will be performed according to methods established in the tests; and (2) correcting yaw in straight boring and maintaining alignment for a curved tunnel axis can be attained easily. (USBR)
W71-09056

EXPERIMENTS IN ROCK CUTTING BY IMPACT METHODS,
Marwin Mining Tools Ltd., Rothley (England).
J. Furby.
Tunnels Tunnelling, Vol 2, No 6, p 359-365, Nov-Dec 1970. 6 p, 17 fig, 2 tab, 2 ref.

Descriptors: *Rock excavation, Rocks, Cutting, *Impact, Grooves, Test procedures, Excavation, Methodology, Rapid excavation, Laboratory tests, Research and development, Tunneling, Excavators, Foreign research.
Identifiers: *Cutters.

A test program to evaluate a method of cutting rock using a system of rigid tungsten carbide tipped flails called tines that cut by impact with the rock surface is described. Each tine is suspended freely on a steel pin. The pins are mounted on the periphery of a drum. By revolving the drum at high speed, each tine is flung outward to lie radial to the drum center. When the drum is moved toward the surface to be cut, each tine strikes the surface in turn. Concrete blocks made from one mix were cut to evaluate the effects of tine impact, depth of cut, direction or rotation, and power requirements for different tip shapes. Conclusions are: (1) moving the tine from the cut to the free surface is the preferred direction of rotation; (2) certain minimum tine velocity is required to obtain maximum-material removal; (3) cutting deep slots requires more energy than cutting shallow grooves; (4) tines cut effectively even with a cutting edge radius of 0.25 in.; (5) complete cutting of concrete is obtained with a tine spacing up to twice the tine width; and (6) tines cut cleanly through concrete and asphalt aggregates. Test results suggest that tines could be used advantageously for certain rock cutting applications when rock removal rather than rock production is required. (USBR)
W71-09058

DESIGN OF A WATER CANNON FOR ROCK TUNNELING EXPERIMENTS,
Terraspace, Inc, Bethesda, Md.
William C. Cooley, Franklin L. Beck, and Daniel L. Jaffe.
Available from the National Technical Information Service as PB-198 050, $3.00 in paper copy, $0.95 in microfiche. DOT-Office of High Speed Ground Transportation Report FRA-RT-71-70, Jan 15, 1971. 76 p. DOT-FR-00017.

Descriptors: *Tunneling, *Excavation, *Tunneling machines, Rock mechanics, *Jets, Rock excavation, Fractures.
Identifiers: *Hydraulic jets, Hydraulic servomechanisms, Pneumatic servomechanisms, *Water cannons.

A detailed design is presented for manufacturing a high pressure pulsed water cannon for rock-breaking experiments in a tunnel or quarry at jet pressures up to 106 psi. The test system includes a trailer for carrying the water cannon, and a separate dolly for the power system and controls. The water cannon incorporates components of a Terrapak hydro-pneumatic actuator and is designed to fire one pulse every 5 minutes, but can be modified to fire 20 pulses per minute with a pulse energy of 93,500 ft.lbs. This report covers the system analysis, design studies and detailed design of the water cannon system and discusses fabrication, operation and test procedures.
W71-09362

10. SCIENTIFIC AND TECHNICAL INFORMATION

BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY STUDIES, ATLANTIC-PACIFIC INTEROCEANIC CANAL, BIBLIOGRAPHY,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05C.
W71-09006

BIOENVIRONMENTAL AND RADIOLOGICAL-SAFETY FEASIBILITY STUDIES, ATLANTIC-PACIFIC INTEROCEANIC CANAL, POSSIBLE EFFECTS OF A SEA-LEVEL CANAL ON THE MARINE ECOLOGY OF THE AMERICAN ISTHMIAN REGION, ABSTRACTS, THESAURUS,
Battelle Memorial Inst., Columbus, Ohio.
For primary bibliographic entry see Field 05C.
W71-09007

A PRELIMINARY BIBLIOGRAPHY OF MATHEMATICAL MODELING IN ECOLOGY,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05C.
W71-09025

A SELECTED BIBLIOGRAPHY OF TERRESTRIAL, FRESHWATER AND MARINE RADIATION ECOLOGY,
Washington State Univ., Pullman; and Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 05C.
W71-09232

THE STUDY OF THE PHYSICAL, CHEMICAL AND BIOLOGICAL NATURE OF WATER QUALITY UNDER UTAH CONDITIONS,
Utah State Univ., Logan.
For primary bibliographic entry see Field 05A.
W71-09268

WATER ANALYSIS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05A.
W71-09289

HYDROLOGY OF COASTAL WATERS,
Texas A and M Univ., College Station; and Texas Engineering Experiment Station, College Station. Coastal and Ocean Engineering Div.
For primary bibliographic entry see Field 02L.
W71-09365

INTERACTION OF PESTICIDES WITH AQUATIC MICROORGANISMS AND PLANKTON,
Arizona Univ, Tucson, Dept. of Entolmology.
For primary bibliographic entry see Field 05C.
W71-09381

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W71-09191 05C

MECHANISMS OF THE ACCUMULATION OF PLUTONIUM-239 AND POLONIUM 210 BY THE BROWN ALGA ASCOPHYLLUM NODOSUM AND MARINE PHYTOPLANKTON,
W71-09193 05C

RADIONUCLIDE CYCLING IN NATURAL POPULATIONS OF AMPHIBIANS. ANNUAL PROGRESS REPORT, JUNE 16, 1969-JUNE 15, 1970,
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EVALUATION OF RADIOACTIVE POLLUTION TRANSFER TO OCEAN AND SEA FOOD CHAINS (IN FRENCH),
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LEVEL OF RADIOACTIVE CONTAMINATION IN THE ENVIRONMENT AND IN THE FOOD CHAIN. ANNUAL REPORT, 1968 (IN FRENCH).
W71-09230 05C

RADIATION SURVEILLANCE - MONITORING THE ENVIRONS OF A NUCLEAR STATION,
W71-09249 05A

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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

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VOLUME 4, NUMBER 18
SEPTEMBER 15, 1971

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

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To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

A LABORATORY STUDY OF THE SOLUBLE METALS IN ROCK FROM THE BROAD QUADRANGLE, GEORGIA,
Georgia Inst. of Tech., Atlanta. Water Resources Center.
For primary bibliographic entry see Field 02K.
W71-09466

CARBONATE SPECIES AND NOT POLYWATER FORMED ON MAGNESIUM OXIDE,
Cambridge Univ. (England). Colloid Science Labs.; and Cambridge Univ. (England). Dept. of Biochemistry.
D. L. Whateley.
Nature, Physical Science, Vol 231, No 25, p 178-179, June 21, 1971. 2 p, 2 ref.

Descriptors: *Water properties, *Aqueous solutions, *Carbonates, Magnesium, Spectroscopy, Water analysis, Water chemistry.
Identifiers: *Polywater.

The infrared spectrum of polywater formed on magnesium oxide can more readily be interpreted in terms of the presence of carbonate species. Magnesium oxide readily adsorbs carbon dioxide, and the infrared spectra of carbon dioxide and water adsorbed separately and together on MgO powder show a number of adsorption bands in the region 1,300-1,665/cm. The observation that magnesium hydroxide or MgO after soaking in liquid H2O gives no such spectrum supports the interpretation of the observed spectrum in terms of carbonate species. (Knapp-USGS)
W71-09625

02. WATER CYCLE

2A. General

HYDROLOGIC RECONNAISSANCE OF THE DELTA RIVER AND ITS DRAINAGE BASIN, ALASKA.
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. L. Dingman, H. R. Samide, D. L. Saboe, M. J. Lynch, and C. W. Slaughter.
Available from the National Technical Information Service as AD-722 217, $3.00 in paper copy, $0.95 in microfilm. CRREL Research report 262, Feb 1971. 83 p.

Descriptors: *Rivers, *Flow, *Drainage, Hydrologic date, *Glaciers, Melting, Sedimentation, Rainfall, Inland waterways, Remote sensing, Aerial photography.
Identifiers: Aerial reconnaissance, *Alaska, Hydraulic models, Delta River, Stream flow.

A one-year reconnaissance study was made of a large braided glacial river and its drainage basin (drainage area 1665 m2; elevation range 1000 - 10,000 ft) for which a minimum of hydrometric and meterologic data existed. The report includes estimates of the water balance, flow-duration curves, and sediment characteristics, and descriptions of stream response to glacial melt and rain, channel geometry and channel processes. Mean annual basin precipitation is estimated at 40.4 in. and mean annual loss of permanent glacial storage is about 1 in. About 30% of this leaves the basin as evapo-transpiration, 50% as stream flow, and 20% as groundwater flow. Characteristics of response to glacial melt are outlined. Flow peaks near the mouth occur with 24 hours of rainfall greater than 1.5 in./day at foothills meterological stations; rains of less than that amount do not generally produce discernible stream response. Stream channel geometry is described in detail. Most channels on the lower floodplain are assymmetrical and are roughly triangular or parabolic, and have high width/depth ratios. At-a-station hydraulic geometry is described. Surveys and ground and aerial photography are used to describe channel changes.
W71-09566

FORECASTING THE SPRING 1969 MIDWEST SNOWMELT FLOODS,
National Weather Service, Kansas City, Mo, Central Region.
Herman F. Mondschein.
Available from the National Technical Information Service as COM71-00489, $3.00 in paper copy, $0.95 in microfiche. NOAA Technical memorandum NWS-CR-40, Feb 1971. 5 p.

Descriptors: *Flood forecasting, *Snow melt, *Flood Control, *Mathematical models, Missouri, Sequential generation, Surface runoff, Snowfall.
Identifiers: Spring season, Sequential analysis.

The winter of 1968-69 in the upper midwest was one of the worst on record, resulting in a long period of very heavy snow of high water content over a very large area, with widespread, disastrous spring floods in its wake. The use of hydrologic data by the National Weather Service's River Forecast Center in Kansas City, Missouri, to estimate flood potential up to 2 1/2 months prior to the onset of flooding, and for day-by-day short-term flood forecasting is described. The principle ingredients involved in determining the magnitude and extent of snowmelt flooding are shown to be: (1) the depth of runoff which is a function of water equivalent of the snowpack at the onset of melt, precipitation during the melting period, and antecedent soil moisture. (2) the rate of melt which is shown to be related to daily air temperature and showpack water content. The application of digital computer technology to hydrologic models has been of inestimable value in the processing of hydrologic data for the specific purpose of river stage and flood forecasting. Examples of these computer applications to flood prediction in the 1969 upper midwest spring snowmelt floods are shown.
W71-09571

CONVERGENCE CRITERIA FOR ITERATIVE HYDROLOGIC ROUTING MODELS,
Water Resources Engineers, Inc., Springfield, Va.
G. K. Young.
Water Resources Research, Vol 7, No 3, p 536-542, Jun 1971. 7 p, 1 fig, 5 tab, 4 ref. Bur Public Roads Contract FH-11-7324.

Descriptors: *Routing, Numerical analysis, *Rainfall-runoff relationships, Open channel flow, Dynamic programming, Mathematical studies, Mathematical models, Water storage, Stage-discharge relations, Model studies.
Identifiers: *Routing models.

An iterative process used to solve flow dynamics is discussed using a highway culvert and embankment system as an example. Time step criteria govern convergence of the iterative process. The Lipschitz ratio is applied to calculate the controlling algebraic time step relationship. The time step for convergence varies with current inflow and antecedent storage. Parameters of the iterative process are calculated for the example by assuming nonlinear functional forms for stage storage and discharge storage relationships by inferring the appropriate coefficients. Numerical results are presented for several extreme cases that bracket orifice and weir flow conditions. The approach should be applicable to other hydrologic systems such as small dams, catch basin flow, and retarding basins. This analysis aids in a selection of a time increment for direct routing for the direct conversion of rainfall excess to watershed outflow. (Knapp-USGS)
W71-09610

AN OUTLINE OF THE DEVELOPMENT OF HYDROLOGY IN THE USSR (Russian: Ocherki razvitiya gidrologii v SSSR),
A. A. Sokolov, and A. I. Chebotarev.
Leningrad, Gidrometeoizdat, 1970. 310 p.

Descriptors: *Water resources, *Water resources development, *Water balance, *Hydrologic data, *Hydrologic aspects, Forecasting, Flow, Hydrographs, Runoff, Soils, Rivers, Hydrometry, Lakes, Reservoirs, Floods, Evaporation, Ice, Snow, Instrumentation, Heat balance.
Identifiers: *USSR, State Hydrological Institute, Hydrophysical studies, Hydrochemical studies, Hydrological stations.

A history of the study of water resources of the USSR is examined with particular reference to investigations conducted by a leading institute in Soviet hydrological research, the State Hydrological Institute. The role of the Institute in establishing a basic network of hydrological stations and in developing theoretical, experimental and field studies is discussed in the light of concrete achievements and trends observed in the utilization of water. Plans for the maximum development of USSR water resources involve water balance estimates to 1980, 2000, and even beyond, taking into account the rapidly growing exploitation of water resources and the influence of human activity on the transformation of river regimes. A bibliography of the more important Soviet publications on hydrology is appended to each of the 11 chapters. (Josefson-USGS)
W71-09646

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 06A.
W71-09735

USE OF HARMONIC ANALYSIS TO STUDY TIDAL FLUCTUATIONS IN AQUIFERS NEAR THE SEA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02F.
W71-09824

VARIABILITY OF ANNUAL RUNOFF IN THE LAKE ONTARIO BASIN,
Windsor Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W71-09825

2B. Precipitation

AIRBORNE MEASUREMENTS OF THE TOTAL HEAT FLUX FROM THE SEA DURING BOMEX,
California Univ., San Diego, La Jolla; Scripps Institution of Oceanography, La Jolla, Calif.; and Atlantic Oceanographic and Meteorologic Labs., Miami, Fla.
For primary bibliographic entry see Field 07B.
W71-09602

MONSOONAL RESPONSE IN THE WESTERN INDIAN OCEAN,
Rosentiel School of Marine and Atmospheric Science, Miami, Fla.; and National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
Walter Duing, and Karl-Heinz Szekielda.
Journal of Geophysical Research, Vol 76, No 18, p 4181-4187, June 20, 1971. 7 p, 4 fig, 1 tab, 15 ref. ONR Contract N0014-67-A-0201-0013, Project NR 083-06017-16-70 (481).

Descriptors: *Ocean currents, *Indian Ocean, *Monsoons, *Synoptic analysis, Winds, Advection,

Currents (Water), Convection, Temperature, Heat balance, Seasonal, Climatology.
Identifiers: *Somali current.

Infrared observations from spacecraft were used to investigate the response of the Somali Current to the onset of the southwest monsoon. Selected satellite observations from three years were available for this study. The time-dependent development of horizontal temperature gradients at the sea surface serves as an indicator for the formation of the baroclinic structure of the Somali Current. A comparison is made with the simultaneous development of the southwest component of the monsoon wind. The investigation reveals that the temperature gradient during the early formation stage in all years are directly proportional to the wind speed. The phase lag between the development of wind and temperature gradient during the buildup of the boundary current has a mean value of twelve days. During the decay period in late summer and fall, the lag increases continuously up to forty days. The observations suggest that two phenomena of different spatial scales play an important role during the formation of the Somali Current; in the early stage (May, June), local wind-induced upwelling seems to be the more important source of baroclinicity; in the latter stage of the buildup (July), large-scale geostrophic effects seem to be dominating. (Knapp-USGS)
W71-09603

THE METEOROLOGY OF KANSAS DROUGHTS,
Kansas Water Resources Board, Topeka.
Donald Kostecki.
Kansas Water News, Vol 13, Nos 4, 5, and 6, p 17-21, 1970. 5 p, 2 fig, 2 tab, 5 ref.

Descriptors: *Droughts, *Kansas, *Meteorology, *Synoptic analysis, Reviews, Climatology, Dust storms, Moisture deficit, Precipitation (Atmospheric), Water storage.

A brief review is presented of the causes and effects of droughts in Kansas. In Kansas, except for the dry-weather flow of some streams and the water pumped from confined aquifers, precipitation is the only source of water supply. Consequently, and particularly when concerned with an extended dry period, the amount of precipitation received compared to the normally expected amount during the period is a reasonable measure of the magnitude of moisture deficiency. Drought is caused by the persistence of a given pattern of large high and low pressure cells in the global circulation pattern of the atmosphere. Normally, a dynamic high pressure cell, called the Azores High, expands during the warm months of the year and contracts during the colder months. As it expands, it pumps moist air from the Gulf of Mexico into the Great Plains in the spring and the contact of the warmer moist air with colder continental air creates the spring and early summer rains common to Kansas. As it contracts in the fall, another increase in rainfall occurrences often takes places. However, if this high pressure cell expands earlier and remains longer, the effect is a lack of precipitation and drought conditions. Droughts of the 1930's and 1950's were not equally severe for all parts of Kansas. The 1950's drought was the worst of record for much of eastern Kansas, and the peak of the drought of 1956 was more severe than any peak period during the 1930's for most areas of the state. In contrast, the drought of the 1930's was by far the longest of record with more disastrous consequences state-wide. (Knapp-USGS)
W71-09656

A THREE-DIMENSIONAL APPROACH TO THE EXCHANGE OF HEAT AND WATER VAPOR BETWEEN A LARGE WATER BODY AND THE ATMOSPHERE,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 02D.
W71-09739

WATER RESOURCE OBSERVATORY WIND DATA - WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie.
For primary bibliographic entry see Field 07C.
W71-09745

2C. Snow, Ice, and Frost

WATER CONDITIONS IN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.

Report No 1, February 1, 1971, 15 p, 24 fig, 3 tab. Bulletin No 120-71.

Descriptors: *Snow surveys, *California, *Snowpacks, *Water supply, *Runoff, Reservoir storage, Water resources, Precipitation (Atmospheric), Snow.
Identifiers: *Water conditions.

The first monthly comprehensive statewide snow surveys of the 1971 season revealed that California's snow zone is storing up to one and one-half times the normal amount of water. A nine day storm in November, followed by a second intense cold storm that continued into December, produced a near record early season snowpack. This heavy snow cover was somewhat diminished during mid-January when moderate but warm rains swept over the mountain crests in Central and Northern California. In addition to causing a short period of premature runoff from the snowpack, the rains brought higher elevation snow densities up to about 40%, which is higher than usual for the time of year. This may accelerate early ripening of the snowpack this year. Runoff quantities during January reflected the storm pattern, producing up to 200 percent of normal flows in the northern part of the state, about 130 percent of normal in the central portion, and diminishing to near average in the San Joaquin Valley tributaries. Reservoir storage is excellent throughout the state, benefiting from January's warm rainstorms that produced extensive low elevation snowmelt inflows, especially in central and northern California streams. (Poertner)
W71-09586

PHYSICAL PROPERTIES OF ALPINE SNOW AS RELATED TO WEATHER AND AVALANCHE CONDITIONS,
Forest Service (USDA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
M. Martinelli, Jr.
Forest Service Research Paper RM-64, January 1971. 35 p, 18 fig, 6 tab, 34 ref, append.

Descriptors: *Avalanches, *Snowpacks, *On-site tests, *On-site data collections, Sampling, Colorado, Snow management, Safety, Shear strength, Tensile strength, Compressive strength, Stress, Strength of materials, Yield strength, Forecasting, Surveys, Density, Permeability, Weather, Snow.
Identifiers: *Snow physical properties, *Avalanche forecasting.

Data were taken in avalanche starting zones at an elevation of 11,700 feet in Front Range of Colorado within 14 days of deposition. Densities varied from 40 to 450 kg per cu m. A statistical criterion was used to identify snow with unusually high density for its age (initial hard slab) and unusually low (persistent soft snow). Initial hard slab, found in 15 percent of the samples, correlated with moderate to high windspeeds, low temperatures, and presence of wind-transported snow. No good way was found to distinguish initial hard slab from dense older snow. Tensile strength from a spin test varied from 1.0 to 1,712 grams force per sq cm. Strength increased with density but varied greatly for given density. Younger snows tended to be weaker than older snows of the same density. Strength was also measured with shear box and and shear vane. Ram resistance was higher for alpine snow than for snow of the same density in trees. Air permeability varied with the low flow rate used. The ratio of virtual porosity/porosity, which averaged 1.062, was of little value for identifying wind slab. (Knapp-USGS)
W71-09596

A STUDY OF WINTERTIME HEAT LOSSES FROM A WATER SURFACE AND OF HEAT CONSERVATION AND HEAT ADDITION TO COMBAT ICE FORMATION IN THE ST. LAWRENCE RIVER,
National Research Labs., Ottawa (Ontario).
For primary bibliographic entry see Field 02D.
W71-09773

2D. Evaporation and Transpiration

EVAPOTRANSPIRATION AND ITS CHEMICAL REDUCTION,
Kansas State Univ., Manhattan. Water Resources Research Inst.
William L. Powers, Gary M. Paulsen, Rosendo K. Palis, Lynn J. Brun, and Edward T. Kanemasu.
Available from the National Technical Information Service as PB-200 823, $3.00 in paper copy, $0.95 in microfiche. KWRRI Contribution No 64, (June 1971), 58 p, 13 fig, 1 tab, 21 ref. OWRR Project B-010-KAN (1).

Descriptors: *Evapotranspiration, *Transpiration, Kansas, *Lysimeters, Microclimate, Photosynthesis.
Identifiers: *Antitranspirants.

This project consisted of a laboratory phase and a field phase. For the laboratory phase several chemicals were screened for their potential in decreasing transpiration. Because transpiration is water evaporation from the stomata of plant leaves, chemicals which partially close the stomata will reduce transpiration. The closure of the stomata may also reduce CO_2 diffusion into the plant and thus may reduce photosynthesis and crop yield. Measurements of both photosynthesis and transpiration were made on plants treated with selected chemicals. Several chemicals appeared promising. For the field phase, two sensitive weighing lysimeters were constructed and various atmospheric sensors assembled on a 5-acre site about 2 miles southwest of Manhattan, Kansas. During the summer of 1970 sorghum and soybeans were planted on this site and the evapotranspiration from these crops characterized. A model for evapotranspiration based on the resistance to vapor diffusion of a single leaf was tested on an hourly basis. (Powers-KWRRI)
W71-09556

EVAPOTRANSPIRATION AND ENERGY BALANCES OF FOREST AND FIELD,
Aberdeen Univ. (Scotland). Dept. of Botany.
S. J. Tajchman.
Water Resources Research, Vol 7, No 3, p 511-523, Jun 1971. 13 p, 2 fig, 7 tab, 48 ref.

Descriptors: *Evapotranspiration, *Crop, *Forests, *Energy budget, *Heat balance, Convection, Heat transfer, Potatoes, Solar radiation, Microclimatology, Micrometeorology, Advection, Heat flow, Vegetation effects.

The energy and water balance components of a 7-year-old Norway spruce forest, a 2-year-old alfalfa field, and a potato field near Munich Germany were computed for the period May-October 1967 by using hourly averages of meteorologic parameters. Turbulent diffusion and energy budget methods were used to determine evapotranspiration and convective exchange. The two methods yielded satisfactory agreement for the low crops but not for the forest. The mean seasonal albedo values for the potatoes and crops but not for the forest. The mean seasonal albedo values for the potatoes and the alfalfa were 0.18 and 0.22, respectively. The albedo of the forest was obtained for

day and averaged 0.05. The shortwave incoming radiation over the forest was 12% less than that over the fields. The net shortwave radiation over the forest was 2 and 7% greater than that over the potatoes and the alfalfa, rexpectively, whereas the long wave emission from the forest was 22 and 15% less than that from the potatoes and the alfalfa, respectively. The total net radiation over the forest was 20% greater than that over the alfalfa and 16% greater than that over the potatoes. Sensible heat flux from the forest was 2.6 and 1.6 times greater than that from the alfalfa and the potatoes, respectively. Evapotranspiration from the forest was 4% less than that from the alfalfa but 14% greater than that from the potatoes. The exchange coefficient at the top of the trees was about 100 times as large as that at the top of the crops. (Knapp-USGS)
W71-09608

A THREE-DIMENSIONAL APPROACH TO THE EXCHANGE OF HEAT AND WATER VAPOR BETWEEN A LARGE WATER BODY AND THE ATMOSPHERE,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Gour-Tsyh Yeh, and Wilfried Brutsaert.
Available from the National Technical Information Service as PB-201 003, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 30, April 1971, 23 p, 7 fig, 6 tab, 9 ref. OWRR Project A-021-NY (1).

Descriptors: *Turbulence, Diffusion, *Evaporation, Atmosphere, Heat, Water vapor, Heat balance, Heat budget, Turbulent flow.

In the finite difference formulation of the two-dimensional steady state turbulent diffusion equation for solving evaporation problems, two difficulties arise caused by the automatic satisfaction of one of the boundary conditions at the surface and by the infinite size of the solution domain. A general numerical scheme is developed to overcome these difficulties by the use of appropriate transformations. The results of some numerical experiments show that the longitudinal diffusion term is usually negligible and that with suitable parameters for roughness and stability power laws can be as useful for practical solutions as the more complicated logarithmic law.
W71-09739

A STUDY OF WINTERTIME HEAT LOSSES FROM A WATER SURFACE AND OF HEAT CONSERVATION AND HEAT ADDITION TO COMBAT ICE FORMATION IN THE ST. LAWRENCE RIVER,
National Research Labs., Ottawa (Ontario).
F. W. Pruden, R. L. Wardlaw, D. C. Baxter, and J. L. Orr.
Division of Mechanical Engineering, Report No. MD-42, p. 189, June 30, 1954. 34 fig., 13 tab., 112 ref.

Descriptors: *Heat transfer, *Water temperature, *Evaporation, *Solar radiation, *Navigable rivers, Meteorology, Heat flow.
Identifiers: *Ice formation, *Heat addition, *St. Lawrence River, Ice control, Heat loss, Heat conservation.

Re-examination of the technical problems of providing year-round navigation in the St. Lawrence River seaway, ship canal, the gulf and various lake parts are discussed in the present work. A major part of the problem is considered to be the maintenance of navigation in the St. Lawrence River from Lake Ontario to Three Rivers, Quebec, where tidal effects began to be felt. The description of the heat loss process in the river is taken in two parts: (1) formulation of the heat loss rate in a sufficiently simple coefficient form that can be integrated along the length of the river and throughout the season, and (2) the expression of the meteorological statistics as the probability of occurrence of a particular condition at a particular locality. Calculated total heat loss rates were found to be in reasonable agreement with observations under normal conditions. Difficulties of predicting extreme values of heat loss in the design of protection systems are discussed. The design of several systems to extend the navigation season has been examined to determine the parameters to which the design is most sensitive and hence to indicate the most profitable lines of investigation. A rational design procedure for a heater system has been formulated and the order of magnitude of component costs estimated. (Herrera-Vanderbilt)
W71-09773

THE SINUSODIAL FUNCTION OF REGIONAL MONTHLY AVERAGE RELATIVE PAN EVAPORATION,
Tecnion - Israel Inst. of Tech., Haifa. Dept of Civil Engineering; and Water Planning for Israel Ltd., Tel Aviv.
Joseph S. Dalinsky.
Water Resources Research, Vol 7, No 3, p 677-687, June 1971. 11 p, 5 fig, 4 tab, 6 ref.

Descriptors: *Evaporation, *Fourier analysis, Regional analysis, Climatology, Arid lands, Statistical methods, Statistics, Evaporation pans, Seasonal.
Identifiers: *Israel.

An analysis was made of data from 47 stations in Israel at which evaporation had been measured by means of U.S. Weather Bureau class A pans protected by wire mesh. The stations represent different climatic conditions ranging from subhumid to arid. The stations are situated on the Mediterranean coast, in the desert (the Arava Valley), in valleys, in plains, and in mountains. The average relative evaporation in each month was found to be equal at all the stations and could be expressed as a sinusoidal functions. The small deviation from the sinusoidal function make computation of correlations superfluous. As a result of this finding, it is possible to estimate the average evaporation rates for every month and for every location in the country by using one parameter (the amplitude of the sine function) and a map of average annual evaporation depths. (Knapp-USGS)
W71-09814

EVAPORATIVE CAPACITY OF UNSATURATED AIR,
National Weather Service, Rockville, Md. Office of Hydrology.
A. K. Showalter.
Water Resources Research, Vol 7, No 3, p 688-691, June 1971. 4 p, 2 fig, 1 tab, 2 ref.

Descriptors: *Evaporation, *Microenvironment, *Temperature, Vapor pressure, Raindrops, Drops (Fluids), Humidity.
Identifiers: *Evaporative capacity (Air).

Falling water droplets quickly assume surface temperatures equal to the wet-bulb temperature of the air. Formulas for absolute humidity and Ferrel's psychrometric formula are used to develop a simple relationship for calculating the capacity of air to absorb water droplets evaporated into it. Such data may be used for determining water losses during sprinkler irrigation, the discrepancy between radar observed liquid water contents and ground observed rainfall, and other factors important in the hydrologic balance of the atmosphere. The evaporative capacity of the air is determined to be explicitly defined by an equation involving wet-bulb temperature, wet-bulb depression, and atmospheric pressure. (Knapp-USGS)
W71-09818

2E. Streamflow and Runoff

PRELIMINARY REPORT ON THE WATER RESOURCES OF SOUTHEAST MAUI, HAWAII,
Geological Survey, Honolulu, Hawaii.
K. J. Takasaki.
Hawaii Division of Water and Land Development Circular C58, March 1971. 37 p, 10 fig, 3 tab, 13 ref.

Descriptors: *Water resources development, *Groundwater, *Surface waters, *Hydrologic data, *Hawaii, Rainfall-runoff relationships, Springs, Aquifer characteristics, Hydrogeology, Geology, Permeability, Streamflow, Water yield, Water quality, Chemical analysis, Water utilization, Grazing, Livestock, Flow measurement, Perched water, Water storage, Hydrographs.
Identifiers: Maui (Hawaii), Basal water.

Southeast Maui, Hawaii, is about 135 square miles in area and comprises the southern part of Haleakala National Park and the southern slope of Haleakala. The principal land use is low-intensity grazing. Population in 1970 was less than 100. Mean annual rainfall ranges from about 25 inches throughout the central part to about 100 inches near the eastern boundary and to about 50 inches near the western boundary. In about half of the study area, the surface rocks are lava flows of the Kula Volcanic Series. In the other half, the Kula Series is overlain by highly permeable rocks of the Hana Volcanic Series. In most areas where the Hana Series crops out, rainfall absorption is so high and overland runoff so low that stream patterns have not been developed. Where the surface rocks are the less permeable Kula Series, runoff is higher and shallow stream channels have developed. Groundwater occurs as perched water and as basal water and likely as dike-impounded water in rift zones. The principal need for water is for livestock supply. (Woodard-USGS)
W71-09598

FLOOD PLAIN INFORMATION, TINKERS CREEK, TWINSBURG, SUMMIT COUNTY, OHIO.
Corps of Engineers, Buffalo, N.Y.
For primary bibliographic entry see Field 04A.
W71-09601

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1970,
Geological Survey, Honolulu, Hawaii.
C. J. Ewart.
Geological Survey Hawaii Basic Data Progress Report 13, March 1971. 166 p, 5 fig, 1 tab.

Descriptors: *Hydrologic data, *Peak discharge, *Hawaii, *Floods, Frequency analysis, Gaging stations, Stream gages, Data collections, Stage-discharge relations, Water levels.
Identifiers: Flood frequency.

Floods--mainly because of the high frequency of intense rainfall--are common in Hawaii. Knowledge of the magnitude and probable frequency of floods is necessary for design of control and conveyance structures, pollution abatement facilities, and planning for use of flood plains. Flood data are obtained through a network of stream-gaging and peak-discharge stations. The crest-stage gage data-collection network, begun on Oahu in 1957, was extended to Hawaii and Kauai in 1962 and Maui and Molokai in 1963. Records of floods from the regular long-term gaging station network augment those from the crest-stage gage network. Records of annual peak stage and discharge at gaging stations through September 30, 1970, and peak discharges at miscellaneous sites, are compiled. At the close of the water year, flood data from 72 regular gaging stations were being supplemented by data from 90 crest-stage gaging stations on Kauai, Oahu, Molokai, Maui, and Hawaii. (Knapp-USGS)
W71-09627

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR PIN OAK CREEK, TRINITY RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-09653

GROUND OBSERVATIONS AND UTILITY EVALUATIONS OF SPACE AND HIGH-ALTITUDE PHOTOGRAPHY, EASTERN ARIZONA,
Raytheon Co., Alexandria, Va. Autometric Operation.
For primary bibliographic entry see Field 07B.
W71-09654

FLOOD WAVE MODIFICATION ALONG A PRISMATIC RIVER,
Indian Inst. of Tech., Kharagpur. Dept. of Civil Engineering.
Somenath Ghosh.
Water Resources Research, Vol 7, No 3, p 697-703, June 1971. 7 p, 8 fig, 8 ref, append.

Descriptors: *Floods, *Flood routing, *Flood forecasting, *Hydrograph analysis, Waves (Water), Stage-discharge relations, Hydrographs, Unsteady flow, Discharge (Water).
Identifiers: Flood wave modification.

The modification of a flood hydrograph in a uniformly wide river reach with no downstream control, taking into account the effect of pseudoviscosity terms, was studied graphically by using the method of characteristics. The routed profiles indicate the usual reduction in peak height and velocity with distance, and the stage discharge curve shows the familiar loop pattern. (Knapp-USGS)
W71-09819

VARIABILITY OF ANNUAL RUNOFF IN THE LAKE ONTARIO BASIN,
Windsor Univ. (Ontario). Dept. of Geography.
Marie Sanderson.
Water Resources Research, Vol 7, No 3, p 554-565, June 1971. 12 p, 5 fig, 4 tab, 13 ref.

Descriptors: *Rainfall-runoff relationships, *Lake Ontario, *Variability, *Water balance, *Statistics, Data collections, Stream gages, Runoff, Streamflow, Hydrologic budget, Great Lakes Region, Climatic data, Meteorological data, Hydrologic data.
Identifiers: *Runoff variability.

A study of variability of runoff in the Lake Ontario basin was undertaken to provide background information for the International Field Year on the Great Lakes to be held in 1972 on Lake Ontario, because a period of 1 year is a small sample in the life history of a lake basin, and there are large annual fluctuations in the variables in the water balance. Because of a lack of long-term records of measured runoff, the Thornthwaite-Mather water balance model for estimating point runoff from climatic data was used for the 81 stations in and near the basin with records of 15-136 years. Statistical tests show that annual station runoff has a normal distribution. Standard deviations were computed to express variability. Maps of average runoff, as well as plus and minus two standard deviations of runoff, were drawn and permit the estimation of the volumes of annual runoff that can be expected in the Lake Ontario basin. A coefficient of variability of runoff map indicates that the southwestern areas of the basin have the most variable runoff. (Knapp-USGS)
W71-09825

2F. Groundwater

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 1, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-09593

HYDROGEOLOGY OF THE CARBONATE ROCKS OF THE LANCASTER 15-MINUTE QUADRANGLE, SOUTHEASTERN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
Harold Meisler, and Alvert E. Becher.
Pennsylvania Geological Survey Fourth Series Bulletin W-26, 1971. 149 p, 25 fig, 2 plate, 11 tab, 29 ref.

Descriptors: *Hydrogeology, *Carbonate rocks, *Pennsylvania, *Groundwater, *Aquifer characteristics, Geology, Aquifers, Water wells, Water yield, Specific capacity, Withdrawal, Drawdown, Water quality, Chemical analysis, Hydrologic data, Springs, Streamflow, Groundwater recharge.
Identifiers: *Groundwater resources, Conestoga Valley (Penn), Southeastern Pennsylvania.

Limestone and dolomite strata of Canbrian and Ordovician age underlie the lowlands of the Conestoga Valley in southeastern Pennsylvania. In the Lancaster quadrangle, where the Conestoga Valley attains its maximum width, the carbonate strata are divided into 14 units defined primarily by their relative proportions of limestone and dolomite. Of the 247 wells test pumped for 1-hour, 25% have specific capacities greater than 5.0 gpm per ft--the minimum considered to adequate for public supply and industrial use; 58% have specific capacities greater than 0.5 gpm per ft--the minimum considered to be adequate for small public supply use, and 83% have specific capacities greater than 0.08 gpm per ft-- the minimum considered to be adequate for domestic use. The average discharge of the Little Conestoga Creek at the Conestoga Country Club for the 1964 calendar year was 43 cfs. Approximately 77% of the total streamflow was drived from groundwater discharge. Groundwater in carbonate rocks of the Lancaster quadrangle generally has a specific conductance of between 400 and 700 micromhos per centimeter. (Woodard-USGS)
W71-09594

EVALUATION OF THE MADISON LIMESTONE IN THE WILLISTON BASIN FROM WELL LOGS AND CORES,
Bureau of Mines, Laramie, Wyo., Energy Research Center.
E. J. White, and L. C. Marchant.
Bureau of Mines Report of Investigations 7497, March 1971. 27 p, 14 fig, 4 tab, 14 ref, 2 append.

Descriptors: *Groundwater movement, *Limestones, *Aquifer characteristics, *North Dakota, *Montana, Porosity, Saturation, Core drilling, Sampling, Boreholes, Oil industry, Petrography, Cores, Chemical analysis, Physical properties, Geology, Hydrogeology, Oil-water interfaces, Water chemistry.
Identifiers: *Core analysis, *Log analysis.

Data from oil well logs and core analyses were used to quantitatively evaluate formation porosity and water saturation of heterogeneous carbonates and to study the pore geometry and performance characteristics of cores from these formations. Logs and cores from the Madison limestone from 233 wells in three fields in the Williston basin of North Dakota and Montana were used in the investigation. A comparison of log and core analyses shows that log porosities are consistently larger than core porosities, and the differences are correlatable with core porosity ranges. Water saturations from logs are usually smaller than the corresponding core saturations by summation of fluids, but the difference is attributable to mud filtrate invasion into the cores during drilling. Petrophysical studies show that the low permeabilities and high residual water saturations in these reservoir rocks are due to their fine crystalline texture and complex pore geometry (heterogenity). It is concluded that both log and core analyses must be used for reliable evaluation of these carbonate formations. (Woodard-USGS)
W71-09595

GROUNDWATER RECONNAISSANCE STUDY OF SELECTED SITES IN ROCKY MOUNTAIN NATIONAL PARK AND SHADOW MOUNTAIN NATIONAL RECREATION AREA,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 04B.
W71-09597

PRELIMINARY REPORT ON THE WATER RESOURCES OF SOUTHEAST MAUI, HAWAII,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W71-09598

HYDRAULIC TESTING OF THE OJO ALAMO SANDSTONE IN HOLE GB-3, PROJECT GASBUGGY, RIO ARRIBA COUNTY, NEW MEXICO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-09599

IMPROVEMENTS IN THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05B.
W71-09611

FORMATION OF FRESH GROUNDWATERS IN THE KONKA-YALY DEPRESSION (Russian: O formirovanii presnykh podzemnykh vod Konksko-Yalynskoy vpadiny),
Kiev State Univ. (USSR).
N. I. Drobnokhod, B. N. Mandrik, and V. S. Shabatin.
Sovetskaya Geologiya, No 3, p 98-108, March 1970. 11 p, 8 fig, 6 tab, 2 ref.

Descriptors: *Groundwater recharge, *Groundwater movement, *Aquifers, Fresh water, Connate water, Clays, Crystalline rocks, Fractures (Geology), Fissures (Geology), Demineralization, Weathering, Hydrogen ion concentration, Water chemistry, Salts.
Identifiers: *USSR, *Ukraine, Konka-Yaly depression, Mineralization, Hydrochemistry.

The recharge of aquifers in Bucha, Kiev-Kharkov, and Poltava deposits of the Konka-Yaly depression is accomplished by groundwater flow from the fissure zone of crystalline rocks of the Azov Sea massif through zones of fractures, which outline the depression on the south and east. Demineralization of the waters during groundwater infiltration through these zones results in fresh waters with a mineralization of 0.4-1.0 g/liter. Demineralization of the waters of the region may be associated with a periodic regeneration of the absorption capacity of clays in the zones of tectonic fractures. This process may be the result of (1) the formation of new clay particles owing to continual weathering of the crystalline rocks of the massif, (2) seasonal fluctuations in the amount of soluble salts in the waters and (3) a change in the acidity of inflowing waters depending upon the time of year. (Josefson-USGS)
W71-09642

PREDICTING EARTHQUAKES BY HYDROGEOLOGICAL METHODS (Russian: K prognozirovaniyu zemletryasenij gidrogeologicheskim metodami),
For primary bibliographic entry see Field 07B.
W71-09643

GROUNDWATER DATA AS OF 1967--CENTRAL COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 07C.
W71-09649

GROUNDWATER DATA AS OF 1967 - SOUTH COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C.
W71-09650

'ATER RESOURCES OF THE SLAGLE-SIMP-ON-FLATWOODS AREA, LOUISIANA,
eological Survey, Baton Rouge, La.
. D. Whiteman, Jr., A. J. Calandro, and W. L. roussard.
ouisiana Geological Survey and Department of ublic Works Water Resources Pamphlet No 24, pril 1970. 23 p, 1 plate, 4 tab, 9 ref.

escriptors: *Water resources development, Groundwater, *Water wells, *Aquifer characristics, *Louisiana, Water yield, Withdrawal, pecific capacity, Hydrologic data, Water utilizaon, Water quality, Chemical analysis, Water temerature, Data collections, Hydrogeology, Water vels, Pumping, Drawdown.
entifiers: *Groundwater resources, *Vernon rish (La), *Rapides Parish (La).

rge quantities of groundwater of good quality are ailable at the communities of Slagle and Simpson d in nearby areas of Vernon Parish, Louisiana. naller, but adequate, quantities of groundwater of od quality are available at and near Flatwoods in apides Parish. Yields of several hundred gallons r minute are obtainable from large-diameter ells in each of the communities. Specific capacis of properly developed large-diameter wells at agle and Simpson are between 5 and 30 gpm/ft of awdown. Specific capacities of 3 to 5 gpm/ft of awdown are obtainable at Flatwoods. At Slagle d Simpson several wells could be installed at a gle location without causing mutual interference completing each well in a different sand. At atwoods only one sand capable of sustaining high ell yields contains water suitable for public-supply e. Streams draining the area contain water of od chemical quality but would not furnish a relia-e supply unless storage facilities were developed. Woodard-USGS)
71-09657

ICROTIME MEASUREMENTS OF GROUND-ATER LEVEL FLUCTUATIONS,
inois State Water Survey, Urbana.
illiam C. Walton.
roundwater, Vol 1, No 2, p 18-19, April 1963.

escriptors: *Water wells, Water table, Groundter, Aquifer characteristics.
entifiers: *Groundwater level fluctuations, icrotime measurements, Pump tests, Methods.

ater-level measurements made during the early conds and minutes of aquifer tests may often be ed to determine the hydraulic properties of an uifer and to locate hydrogeologic boundaries. is paper describes a method, using a modified lus carriage and pen and a stop watch, of record-microtime water-level measurements in a well uipped with a recording gage. Ordinary and crotime records of water-level fluctuations are nultaneously obtained. Microtime water-level easurements often aid in appraising the effects of w gravity drainage under water-table conditions d anisotropic and heterogeneous conditions. ampbell-NWWA)
71-09732

REDICTING WELL YIELDS - TWO CASE ISTORIES,
tchick Consulting Hydrogeologist, White Bear ke, Minn.
r primary bibliographic entry see Field 03B.
71-09733

FFECT OF PHYSICAL PROPERTIES OF OROUS MEDIA ON WATER MOVEMENT,
aho Univ., Moscow. Dept. of Agriculture and o-Resources Engineering.
L. Bloomsburg, and W. M. Carson.
vailable from the National Technical Information rvice as PB-201 001, $3.00 in paper copy, $0.95 microfiche. Technical Completion Report, Sepmber 1970, 20 p, 5 fig, 11 ref. OWRR Project A-5-IDA (2).

Descriptors: *Permeability, Hydraulic conductivity, *Porous media, *Darcy's law, Saturated flow, *Groundwater.

Theoretical and experimental work was conducted to determine the effect of various physical properties of porous media on permeability. The theoretical work involved obtaining a solution for a linearized but complete form of the Navier Stokes equation for flow around a sphere in a rectangular array of spheres. The linearization involved making Oseen's approximation for the convective acceleration terms. The Galerkin method was used and the solution was valid up to a Reynolds number of about 10. The experimental and analytical work showed that the Darcy equation could be used over the entire range of Reynolds numbers as long as it is realized that in the so-called non-Darcy range the coefficient of permeability is dependent on Reynolds number. Experimental data are given for the permeability of various porous materials as a function of Reynolds number with porosity as a parameter.
W71-09737

USE OF THE FINITE-ELEMENT METHOD IN THE SOLUTION OF DIFFUSION-CONVECTION EQUATIONS,
Texaco Inc., Bellaire, Tex.
Y. M. Shum.
Society of Petroleum Engineers Journal, Vol 11, No 2, p 139-144, June 1971. 6 p, 4 fig, 11 ref.

Descriptors: *Diffusion, *Convection, *Porous media, *Mass transport, *Heat flow, Mathematical studies, Variability, Numerical analysis, Groundwater movement.
Identifiers: *Finite difference method.

A variational principle usually applied to the transient heat conduction equation with heat-flux boundary conditions, with a slight modification of the solution technique, is also applicable to diffusion-convection equations. Consideration is given to a one-dimensional transport problem with dispersion in porous media. The finite-element method is employed to reduce the continuous spatial solution into a finite number of time-dependent unknowns. The method can readily be applied to solve problems involving either linear or nonlinear boundary conditions, or both. Results using the finite-element method are compared with several standard finite-difference numerical solutions. The finite-element method is shown to yield satisfactory solutions. (Knapp-USGS)
W71-09804

MOTION OF THE SEAWATER INTERFACE IN COASTAL AQUIFERS: A NUMERICAL SOLUTION,
Technion - Israel Inst. of Tech., Haifa.
U. Shamir, and G. Dagan.
Water Resources Research, Vol 7, No 3, p 644-657, June 1971. 14 p, 11 fig, 6 ref. Technion Grant 012-300

Descriptors: *Saline water intrusion, *Saline water-freshwater interfaces, *Numerical analysis, Dupuit-Forchheimer theory, Groundwater movement, Tides, Tidal effects, Water table, Hydraulic conductivity, Permeability, Computer programs, Unsteady flow.
Identifiers: Coastal aquifers.

The partial differential equations that describe the motion of the seawater interface and the free surface in a phreatic coastal aquifer (or the freshwater head replacing the latter, in the confined case) are presented. They are based on the Dupuit approximation and take into consideration the geometry of the vertical section through the aquifer, in whose plane the flow takes place, as well as the spatial variation of properties of the porous medium and the spatial and temporal distributions of accretion, recharge, and pumping. An implicit numerical scheme is presented to solve the set of simultaneous partial differential equations. The scheme is based on a linearization of the equations and employs a grid with one spacing over the intrusion length and a different spacing in the remainder of the field. Efficient solution of the resulting set of simultaneous linear equations for each time step is achieved by arranging them in a way that results in a 7 diagonal coefficient matrix. Examples are presented, for which the numerical solutions are compared with analytical solutions or laboratory experiments. (Knapp-USGS)
W71-09813

HYDRODYNAMICS AND HYDROCARBON OCCURRENCES, SURAT BASIN, QUEENSLAND, AUSTRALIA,
Research Council of Alberta, Edmonton; and Bureau of Mineral Resources, Geology, and Geophysics, Canberra (Australia).
Brian Hitchon, and John Hays.
Water Resources Research, Vol 7, No 3, p 658-676, June 1971. 19 p, 12 fig, 28 ref.

Descriptors: *Oil fields, *Groundwater basins, *Groundwater movement, *Geochemistry, *Hydrogeology, Investigation, Surveys, Model studies, Mapping, Aquifers, Hydrodynamics, Flow nets, Distribution patterns, Potential flow.
Identifiers: *Australia, *Regional hydrodynamics.

The decision whether to continue petroleum exploration of a sedimentary basin when only marginally attractive oil and gas discoveries have been made is a difficult one, which can be assisted by the application of an appropriate fluid flow model. The pertinency of the Toth-Freeze-Witherspoon model has been proved in the western Canada sedimentary basin, and is now applied to the less explored Surat basin, Australia. The Surat basin consists of a narrow north trending trough filled with Paleozoic strata overlain by a thick, broad cover of Mesozoic sedimentary rocks. Hydraulic head maps and cross sections indicate that hydrocarbon accumulations are associated with quasistagnant portions of discharge areas in which flow is vertical with respect to the bedding, the result being increased salinity of the formation waters caused by membrane filtration and consequently conditions more favorable for the disaccommodation and subsequent accumulation of hydrocarbons. Although the detailed delineation of favorable areas in the Surat basin is difficult with the data presently available, the concepts and approach applied in this paper may be of value to those seeking hydrocarbon accumulations in sedimentary basins throughout the world. (Knapp-USGS)
W71-09817

SEEPAGE THROUGH UNCONFINED AQUIFERS WITH LOWER BOUNDARIES OF ANY SHAPE,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
E. G. Youngs.
Water Resources Research, Vol 7, No 3, p 624-631, June 1971. 8 p, 8 fig, 8 ref.

Descriptors: *Groundwater movement, *Seepage, *Underseepage, *Aquicludes, Dams, Canals, Canal seepage, Soil water movement, Saturated flow, Unsaturated flow, Equations, Porous media, Hydraulic conductivity, Water table, Saline water intrusion, Boundary processes, Dupuit-Forchheimer theory, Stratified flow.
Identifiers: Unconfined aquifers.

Seepage through unconfined aquifers with lower boundaries of any shape is analyzed. The differential equation describing the flow includes a term that involves the pressure distribution on the lower boundary. Although in many problems all the required pressure distribution that enable the seepage problem to be solved are not known exactly, inspection of a given problem gives extreme values of any unknown terms with a final result of known precision. The application of the analysis, checked by electric analog experiments, is illustrated by two examples of seepage problems: first,

the seepage over an inclined plane between two parallel ditches; and second, the seaward flow of freshwater fed by a freshwater reservoir or by rainfall and supported on saline water from the sea. (Knapp-USGS)
W71-09822

USE OF HARMONIC ANALYSIS TO STUDY TIDAL FLUCTUATIONS IN AQUIFERS NEAR THE SEA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
P. A. Carr.
Water Resources Research, Vol 7, No 3, p 632-643, June 1971. 12 p, 6 fig, 8 tab, 15 ref.

Descriptors: *Surface-groundwater relationships, *Tides, *Aquifer characteristics, *Groundwater movement, *Fourier analysis, Waves (Water), Hydraulic conductivity, Permeability, Confined water, Hydrogeology, Time lag.
Identifiers: *Aquifer tests, Harmonic analysis, *Prince Edward Island.

Sixteen days of water level records were collected from a tidal gage and from four wells situated in a line perpendicular to the shore at Borden, Prince Edward Island, Canada. These two sets of records were separated by harmonic analysis into three tidal components. In a confined aquifer, groundwater flow obeys linear potential theory so that each directional component represents a distinct hydraulic conductivity and specific storage test on the aquifer. The use of a line of wells permits the determination of the effective distance and an accurate determination of true tidal efficiency by two different plots. The values of hydraulic conductivity determined this way agree very closely with the values determined by packer tests on nearby wells. The unseparated composite wave was analyzed by using the maxima and minima from four days of records and by assuming a periodicity of 745 minutes. The calculated values of aquifer parameters differed very little from those determined by the individual components. The individual analyses can however produce large errors because they do not permit an accurate determination of the effective distance. (Knapp-USGS)
W71-09824

ANALYSIS OF NONSTEADY FLOW WITH A FREE SURFACE USING THE FINITE ELEMENT METHOD,
Volcani Inst. of Agricultural Research, Bet Dagan (Israel); and California Univ., Berkeley. Dept. of Civil Engineering.
Shlomo P. Neuman, and Paul A. Witherspoon.
Water Resources Research, Vol 7, No 3, p 611-623, June 1971. 13 p, 7 fig, 33 ref.

Descriptors: *Unsteady flow, *Groundwater movement, *Water table, *Numerical analysis, *Saturated flow, Mathematical models, Drawdown, Aquifers, Aquifer characteristics, Computer programs, Withdrawal, Water storage, Groundwater recharge, Specific yield, Porous media, Permeability, Storage coefficient, Discharge (Water), Mathematical studies.
Identifiers: Nonsteady free surface flow, Finite element method.

A new iterative, numerical approach to nonsteady flow of groundwater with a free surface using the finite element method has been developed. The method is unconditionally stable and therefore requires only a small number of time steps to reach the steady state. It can handle problems in which the free surface is discontinuous and portions of the free surface are vertical or nearly vertical. Infiltration or evapotranspiration at the free surface is handled with ease, and the effect of the unsaturated zone can be taken into account indirectly by using the concept of delayed yield from storage. In addition to gravity drainage, the method takes into consideration storage due to the elastic properties of the saturated porous medium. In problems involving flow to a well operating at a prescribed rate, both storage in the well and the actual distribution of velocities along the well bore are taken into account. The method can be applied to a wide variety of problems involving complex boundaries and arbitrary degrees of heterogeneity and anisotropy. Several examples are included to demonstrate some of the features of this new approach. (Knapp-USGS)
W71-09826

LOW RESISTIVITY ON ELECTRIC LOG COULD MEAN 'CHERT',
Schlumberger Well Surveying Corp., Tulsa, Okla.
For primary bibliographic entry see Field 04B.
W71-09906

2G. Water in Soils

A GAMMA ATTENUATION UNIT AND LOGISTIC SYSTEM FOR MONITORING WATER CONTENT OF LARGE SOIL COLUMNS,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 07B.
W71-09614

A STATISTICAL METHOD FOR ANALYSIS OF DIFFUSION IN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
Y. Nakano, and R. P. Murrmann.
Soil Science Society of America Proceedings, Vol 35, No 3, p 397-402, May-June 1971. 6 p, 4 fig, 20 ref.

Descriptors: *Diffusion, *Soil water movement, *Statistical methods, *Mass transfer, Soil physical properties, Soil chemistry, Monte Carlo method, Pesticide residues, Path of pollutants, Frozen soils, Ion transport.

A special Monte Carlo method for use in investigating problems which involve random processes is developed. This approach differs from the usual Monte Carlo method for solution of differential equations in that the random process itself is constructed directly. The power of this approach is demonstrated by application of the method using two examples. In one case, the effect of thermal gradient on ionic diffusion through thin films of interfacial water in frozen clay is examined. The predicted ionic distribution is in agreement both with experimental data and with the result obtained by exact solution of the diffusion equation. In the second example, the distribution of acetone deposited in soil near the soil-atmosphere interface is calculated for a two-layer profile in which the adsorption coefficient and void-porosity vary between horizons. (Knapp-USGS)
W71-09615

ISOTOPICALLY EXCHANGEABLE COBALT: THE EFFECT OF SOIL pH AND IONIC SATURATION OF THE SOIL,
Missouri Univ., Columbia. Dept. of Agronomy.
For primary bibliographic entry see Field 02K.
W71-09617

CALCULATION OF THE LEACHING REQUIRED TO REDUCE THE SALINITY OF A PARTICULAR SOIL DEPTH BENEATH A SPECIFIED VALUE,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
Richard W. Terkeltoub, and K. L. Babcock.
Soil Science Society of America Proceedings, Vol 35, No 3, p 411-414, May-Jun 1971. 4 p, 4 fig, 2 tab, 9 ref.

Descriptors: *Leaching, *Saline soils, *Irrigation water, *Land reclamation, Water quality, Water chemistry, Mineralogy, Gypsum, Soil chemistry.
Identifiers: Soil salinity.

Soil columns containing either Yolo silty clay loam or Hanford sandy loam were prepared with vertically nonuniform salt (Na, Ca, Mg, Cl) and moisture distributions and with gypsum present in the surface soil. The columns were irrigated at both fast and slow rates of water application with a water containing Na, Ca, Mg, and Cl. A simple method for calculating salt movement in soils successfully approximated the resultant salt profiles. A variation in the salt movement computation method was devised for calculating the leaching required to lower the salinity of a particular soil depth to less than a specified value. The method was experimentally verified on both a Yolo and a Hanford soil column, each with vertically nonuniform initial salt and moisture distributions. (Knapp-USGS)
W71-09618

INTRODUCTION TO SYMPOSIUM--THE SOIL SOLUTION,
Agricultural Research Service, Auburn, Ala. Soil and Water Conservation Research Div.
Robert W. Pearson.
Soil Science Society of America Proceedings, Vol 35, No 3, p 417-420, May-Jun 1971. 4 p, 7 fig, 1 tab, 13 ref.

Descriptors: *Conferences, *Soil water, *Soil chemistry, *Water chemistry, Soil-water-plant relationships, Soil environment, Aqueous solutions, Chemical potential.
Identifiers: *Soil solution.

During the 1970 annual meeting of SSSA, August 23-28, at the University of Arizona, Tucson, a symposium was held on the subject of the soil solution. The symposium program consisted of seven papers by society members who have been concerned for many years with the need to clarify the role which the soil solution plays in the chemical reactions within the soil and its contribution to plant growth. Evidence is presented for validity of the concept of soil solution composition as a useful reflection of soil chemical environment that can be related to plant-root growth. Analysis of soil extracts does not give the same information. Sample of the soil solution can be obtained by displacement at any desired moisture level. (Knapp-USGS)
W71-09619

IONIC CONCENTRATIONS AND ACTIVITIES IN THE SOIL SOLUTIONS,
Auburn Univ., Ala. Dept. of Agronomy and Soils.
Fred Adams.
Soil Science Society of America Proceedings, Vol 35, No 3, p 420-426, May-Jun 1971. 7 p, 4 tab, 1 ref.

Descriptors: *Water chemistry, *Soil water, *Soil chemistry, *Aqueous solutions, Hydrolysis, Ions, Chemical reactions, Mineralogy, Computer programs, Chemical potential.
Identifiers: *Soil solutions.

The chemical composition of displaced soil solutions is used to illustrate the procedure for correcting measured ionic concentrations to actual ionic concentrations and ionic activities. The procedure distributes soil-solution electrolytes at equilibrium among their various ionic species by using equations for ion-activity coefficients, ion-pair dissociation, weak-acid and weak-base dissociation, and hydrolysis. More than 20 related equations had to be solved simultaneously; thus, mathematical solution was effected through the method of successive approximation. Rapid correction of soil-solution analytical data to actual concentrations and activities of individual soil-solution ions was made possible by using a computer program. (Knapp-USGS)
W71-09620

SOLUTION OF ION ACTIVITY AND PLANT GROWTH,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
F. E. Khasawneh.

il Science Society of America Proceedings, Vol
, No 3, p 426-436, May-Jun 1971. 11 p, 7 fig, 1
b, 87 ref.

escriptors: *Soil chemistry, *Water chemistry,
queous solutions, *Soil-water-plant relation-
ips, *Absorption, Moisture uptake, Ion
change, Phosphates, Chemical potential.
entifiers: Soil solutions.

e relation of ion uptake to soil solution composi-
n is discussed. Uptake of a given ion depends not
y on its activity in solution, but also on the ac-
ity of other ions and the relation that exists
tween solution ions and exchangeable or solid-
se ions. Methods of combining all these factors
reviewed and evaluated. A dimensionless plot
ates relative plant growth to the ratio of the ion
ivity to the sum of ion activities in solution, and
ms to have a wide range of applicability that ex-
ds from uptake from a nutrient solution in a
ker to uptake from soil solution in situ. (Knapp-
GS)
71-09621

**MPUTATION OF SOIL SOLUTION COM-
SITION VARIATION WITH WATER CON-
NT FOR DESATURATED SOILS,**
ricultural Research Service, Riverside, Calif.
inity Lab.
. Oster, and B. L. McNeal.
l Science Society of America Proceedings, Vol
No 3, p 436-442, May-Jun 1971. 7 p, 2 fig, 7
, 21 ref.

scriptors: *Water chemistry, *Soil water, *Soil
mistry, *Aqueous solutions, *Mathematical
dels, Computer programs, Mineralogy, Calcite,
ion exchange, Simulation analysis, Electrical
nductance, Gypsum, Ion exchange, Chemical
ential.
ntifiers: Ionic activity coefficients.

thematical models were evaluated which calcu-
the change in soil solution composition and
ctrical conductivity as water content is changed
evaporation or extraction by plants. Two models
luded consideration of precipitation of salts, ca-
exchange, soil pH buffer capacity, ionic activi-
, sulfate, bicarbonate and carbonate ion pairs of
cium, sodium, and magnesium, and partial pres-
e of carbon dioxide. A third model included
y the ion pair calcium sulfate. The reliability of
models was evaluated by comparing electrical
ductivities measured by in situ salinity sensors
calculated conductivities. The best model con-
ered the maximum number of ion pairs and used
orm of the Debye-Huckel equation with in-
dual ion parameters. This model resulted in an
rage difference between calculated and mea-
ed values of 1.1 mmho/cm, an error of 6% when
pared to the average measured value of 17.1%
ho/cm. (Knapp-USGS)
1-09622

**OBLEMS ASSOCIATED WITH THE DETER-
NATION AND APPLICATION OF THE
LUBILITY PRODUCT CONSTANT,**
icultural Research Service, Phoenix, Ariz.
ter Conservation Lab.
. Nakayama.
Science Society of America Proceedings, Vol
No 3, p 442-445, May-Jun 1971. 4 p, 2 fig, 23

criptors: *Aqueous solutions, *Water chemis-
*Soil water, *Soil chemistry, *Solubility,
mical potential, Calcium, Carbonates,
sphates, Sulfates, Gypsum, Calcite, Ions,
ilibrium, Hydrolosis.
tifiers: *Solubility product.

iculties encountered in estimating the solubility
luct constants of CaSO4.2H2O and CaCO3
analytical measurements are discussed. A
or factor involved in this formation of com-
es between the constituents of the dissolving solid and other ionic species in solution. Conversely, when the solubility product principle using these constants is applied for predicting the precipitation of ions or the dissolution of a solid in fairly dilute solutions containing various ionic constituents, adequate accounting of all possible combinations of ion association must be made. Prediction problems are still present for solutions at high salt concentrations. (Knapp-USGS)
W71-09623

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLENDE ROCK, I. WEATHERING OF BIOTITE,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
M. J. Wilson.
Clay Minerals, Vol 8, No 3, p 291-303, July 1970. 13 p, 4 fig, 1 plate, 4 tab, 25 ref.

Descriptors: *Soil formation, *Weathering, *Clay minerals, *Ion exchange, *Leaching, Differential thermal analysis, Magnesium, Iron, Adsorption, Chemical analysis, Mineralogy.
Identifiers: *Mica weathering.

The weathering of biotite in a sedentary soil profile developed on biotite-hornblende-rock near Rehiran, Inverness-shire, Scotland, was investigated by optical, X-ray, chemical, infrared and differential thermal methods. In the C horizon a direct transformation to hydrobiotite was observed. This involves oxidation of all the ferrous iron present and subsequent movement of ferric ions from the octahedral sheet. In the B horizon weathering proceeds to a fully expanded 14A phase and this was identified as interstratified vermiculite-chlorite in a 1:1 ratio. Chemical analysis indicates that this stage is accompanied by a substantial addition of magnesium, much of which goes to form the brucite-like interlayers. In the more acid surface horizon these interlayers tend to break down thus yielding a more vermiculitic product. The possible general implications of this type of biotite weathering are briefly discussed. (See also W71-09636) (Knapp-USGS)
W71-09635

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLENDE ROCK, II. THE WEATHERING OF HORNBLENDE,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
M. J. Wilson, and V. C. Farmer.
Clay Minerals, Vol 8, No 4, p 435-444, December 1970. 10 p, 6 fig, 3 tab, 18 ref.

Descriptors: *Weathering, Soil formation, *Leaching, *Ion exchange, *Clay minerals, Clays, Soil chemistry, Mineralogy, Expansive clays, Chemical reactions.
Identifiers: Biotite, Hornblende.

The weathering of hornblende was investigated by optical, X-ray, infrared and differential thermal methods. Optical studies of the fresh hornblende show that it contains discrete lamellar intergrowths of another amphibole which, from infrared evidence, is of an iron-rich nature. This minor phase is selectively weathered in the lower horizons and yields a clay mineral which was identified as interstratified swelling chlorite-saponite. The major hornblende component remains relatively unchanged. Single crystal photographs indicate that the formation of the clay mineral is not structurally controlled by the parent hornblende, although there is a tendency towards alignment along cleavage planes. The clay mineral becomes unstable in the upper part of the profile and could not be detected in the A horizon. (See also W71-09635) (Knapp-USGS)
W71-09636

THE ADSORPTION OF POLY (ETHYLENE GLYCOLS) ON CLAY MINERALS,
Adelaide Univ. (Australia). Waite Agricultural Research Inst; and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.
R. L. Parfitt, and D. J. Greenland.
Clay Minerals, Vol 8, No 3, p 305-315, July 1970. 11 p, 5 fig, 4 tab, 17 ref.

Descriptors: *Adsorption, *Clay minerals, *Alcohols, Free energy, Cation exchange, Cesium, Sodium, Calcium, Aluminum, Ion exchange, Hydration.
Identifiers: Poly (Ethylene glycols).

Poly (ethylene glycols) of molecular weights 200 to 2000 were strongly adsorbed on montmorillonite from aqueous solution. Free energies of adsorption calculated from the adsorption isotherms became more negative with increase in molecular weight and the entropy change became increasingly positive, probably due to a net desorption of water from the clay surface as the organic compound was adsorbed. The adsorption of the higher molecular weight polymers caused an increase in the interlamellar separation. The effect of the exchangeable cation on the adsorption followed the order Cs, Na, Ca, Al, indicating that the cation retained its hydration shell and did not form a direct association with the adsorbed organic molecules. Some evidence was obtained that 'water bridges' were formed between exchangeable calcium an aluminium ions and the ether groups of the polymers. (Knapp-USGS)
W71-09637

ADSORPTION OF WATER BY MONTMORILLONITE - POLY (ETHYLENE GLYCOL) ADSORPTION PRODUCTS,
Adelaide Univ. (Australia). Waite Agricultural Research Inst., and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.
R. L. Parfitt, and D. J. Greenland.
Clay Minerals, Vol 8, No 3, p 317-324, July 1970. 8 p, 4 fig, 2 tab, 18 ref.

Descriptors: *Adsorption, *Clay minerals, *Alcohols, Free energy, Cation exchange, Cesium, Sodium, Calcium, Aluminum, Ion exchange, Hydration.
Identifiers: Poly (Ethylene glycols).

Water adsorption by interlamellar complexes of poly (ethylene glycols) (PEG) and montmorillonite has been determined using a silica spiral spring, and supplementary data obtained by X-ray and infrared techniques. The adsorbed water enters the interlamellar region, where it is associated with the exchangeable cation. The lattice swells to accommodate the intercalated water. Only weak hydrogen bonds are formed between the surface of the clay and the adsorbed water or between adsorbed PEG molecules and adsorbed water. The presence of PEG did not prevent extensive swelling of sodium montmorillonite. (Knapp-USGS)
W71-09638

THE FORMATION OF STABLE SOLS FROM LAPONITE, A SYNTHETIC HECTORITE-LIKE CLAY,
Laporte Industries Ltd., Redhill (England).
B. S. Neumann, and K. G. Sansom.
Clay Minerals, Vol 8, No 4, p 389-404, December 1970. 16 p, 18 fig, 5 tab, 2 ref.

Descriptors: *Clay minerals, *Suspension, *Colloids, *Electrolytes, *Expansive clays, Gels, Phosphates, Water chemistry.
Identifiers: *Sols.

The effects of simultaneous additions of electrolyte and peptizer to dispersion of the synthetic hectorite-like clay, Laponite, have been studied. Unexpectedly, whereas many cations cause gelling and flocculation of the dispersions as expected by col-

loid chemical theory, some cations actually stabilize the sols obtained with peptizer. A relationship was found between the effectiveness of the cations in increasing sol stability and their size and charge. The effects of time, temperature and peptizer concentration was examined. The explanations offered for this phenomenon are based on the idea that the stabilizing cations cause oriented flocculation and, consequently, a reduction of the number of particles available for structure formation. (Knapp-USGS)
W71-09639

LIMITATIONS ON SCALING BY CONTACT ANGLE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
J. R. Philip.
Soil Science Society of America Proceeding, Vol 35, No 3, p 507-509, May-June 1971. 3 p, 2 fig, 8 ref.

Descriptors: *Infiltration, *Wetting, *Soil water movement, Capillary water, Soil physical properties, Model studies.
Identifiers: Contact angle (Capillary), Hydraulic scaling.

The prevalent notion that the (static and dynamic) behavior of liquids in porous media such as soils may be scaled by the contact angle depends on the over-simplication that such media are bundles of long cylindrical capillaries. Observations on such media yield, at best, apparent contact angles which cannot be related directly to contact angle at interfaces within the medium. In some circumstances scaling by apparent contact angle may hold approximately, but this is of only limited value, since apparent contact angle depends not only on the true liquid-solid contact angle, but also on properties of the internal geometry of the medium. These matters are illustrated through the counter-example of a (somewhat more realistic) conical-pore model. (Knapp-USGS)
W71-09806

EXTRACTION OF ANIONS AND CATIONS FROM RECENT VOLCANIC ASH,
Inter-American Inst of Agricultural Sciences, Turrialba (Costa Rica). Research and Training Center.
Elemer Bornemisza.
Soil Science Society of America Proceedings, Vol 35, No 3, p 506-507, May-June 1971. 2 p, 1 fig, 1 tab, 4 ref. USAEC Contract AT (30-1)2043

Descriptors: *Leaching, *Anion exchange, *Volcanoes, Soil chemistry, Water chemistry, Calcium, Magnesium, Sodium, Manganese, Sulfates, Silicates, Ion transport, Salts, Soil water, Solubility.
Identifiers: *Volcanic ash.

Water extracts of ash from Mt. Arenal, Costa Rica's most recently active volcano, contained up to 32 ppm Ca, 3.3 ppm Mg, 4ppm K, 4 ppm Na, and 0.4 ppm Mn.No phosphates were extracted by water, but sulfates reached 35 ppm and silicates 1.6 ppm in the extracts. The sample farthest away from the volcano gave extracts of lowest Ca and Mg content. The pH of diluted NaOH suspension of ash decreased on standing by up to 1.5 pH units. (Knapp-USGS)
W71-09807

FURROW INFILTRATION RATES AS AFFECTED BY INCORPORATION OF STRAW OR FURROW CULTIVATION,
Agriculture Research Service, Prosser, Wash. Soil and Water Conservation Research Div.
D. E. Miller, and J. S. Aarstad.
Soil Science Society of America Proceedings, Vol 35, No 3, p 492-495, May-June 1971. 4 p, 1 fig, 4 tab, 8 ref.

Descriptors: *Infiltration, *Mulching, *Furrow irrigation, *Soil structure, *Cultivation, Soil management, Water utilization, Irrigation water, Furrows, Irrigation practices, Soil treatment.
Identifiers: Furrow infiltration.

Either straw incorporation or cultivation of the furrow bottom greatly increased furrow infiltration into a sandy loam soil during a 3-year study period. Straw incorporation became less effective as the season progressed. A single straw application of 13.4 tons/ha lasted until midway into the second irrigation season. The cultivation treatment caused serious erosion when furrow inflow rates were about 6 liters/min or more. The straw prevented erosion at all inflow rates (up to 8 liters/min). Organic matter contents were significantly increased by the incorporation of straw. Aggregate stabilities followed the same trend, but differences were not statistically significant. (Knapp-USGS)
W71-09808

EFFECT OF ADDED SALT ON NITROGEN MINERALIZATION IN THREE CALIFORNIA SOILS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
F. E. Broadbent, and T. Nakashima.
Soil Science Society of America Proceedings, Vol 35, No 3, p 457-460, May-June 1971. 4 p, 4 fig, 5 tab, 5 ref.

Descriptors: *Nitrogen fixation, *Chemical precipitation, *Nitrogen compounds, *Soil chemistry, *Soil water, Water chemistry, Ammonia, Sulfates, Chlorides, Calcium, Potassium.
Identifiers: *Nitrogen mineralization.

The effect of ammonium sulfate, ammonium chloride, potassium chloride, calcium chloride, aluminum chloride, and copper sulfate, added in amounts corresponding to 0.2, 2, and 20 atm concentration, on mineralization of soil nitrogen in three soils was measured over a 30-day period. Significant increases were produced by the ammonium salts which were labeled with N-15 to allow distinction between added and soil nitrogen. In Aiken clay loam, nitrogen mineralization was also increased by solutions of potassium chloride, calcium chloride, and aluminum chloride, but in Altamont clay loan and in Mormon clay, increases were not consistent. Copper sulfate depressed nitrogen mineralization in all soils. The quantity of organic nitrogen brought into solution was related to the concentration of salt solution. (Knapp-USGS)
W71-09809

THE ROLE OF SPARINGLY SOLUBLE SOLIDS AND CATION EXCHANGE REACTIONS IN CONTROLLING CONDITIONS IN SOIL SOLUTIONS,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
R. C. Turner, and S. Shad Singh.
Soil Science Society of America Proceedings, Vol 35, No 3, p 445-449, May-June 1971. 5 p, 2 fig.

Descriptors: *Aqueous solutions, *Water chemistry, *Solubility, *Soil water, Soil chemistry, Chemical potential, Aluminum, Ion exchange, Clay minerals, Equilibrium, Hydrolysis.
Identifiers: Aluminum hydroxides, *Solubility product, Soil solution.

The application of the principle of solubility products of relatively insoluble solids and exchange reactions to soil problems are discussed. The examples used concern the solubility products of hydroxyaluminum solids, whether thermodynamically stable or metastable, and exchange reactions with clay surfaces involving aluminum and calcium ions. (Knapp-USGS)
W71-09810

2H. Lakes

PHOSPHATE MEASUREMENTS IN NATURA WATERS, A CRITIQUE,
Minnesota Univ., Minneapolis. Limnologi Research Center.
For primary bibliographic entry see Field 05A.
W71-09557

PHYTOPLANKTON DYNAMICS A PRODUCTIVITY IN A SHALLOW, HIGH EUTROPHIC LAKE: WITH SPECI REFERENCE TO MELOSIRA AMBIG (GRUN.) O. MULL. AND M. GRANULA (EHR.) RALFS,
Wisconsin Univ., Madison. Water Resour Center.
For primary bibliographic entry see Field 05C.
W71-09561

RADIATION REGIME OF LAKES AND RES VOIRS (Russian: Radiatsionnyy rezhim oze vodokhranilishch),
T. V. Kirillova.
Leningrad, Gidrometeoizdat, 1970. 253 p, 67 132 tab, 331 ref.

Descriptors: *Radiation, *Albedo, *Bodies water, *Lakes, *Reservoirs, Solar radiation, S Cloud cover, Meteorological data, Climatolo Air temperature, Atmosphere, Atmosphe physics, Humidity, Coasts, Weather data, Air-w interfaces, Air-earth interfaces, Heat bala Seasonal.
Identifiers: *USSR, Volgograd reserv Novosibirsk reservoir, Lake Sevan, Radiat balance, Water surface, Total radiation, Effec radiation, Radiometers, Actinometry.

Contrary to popular belief, the total radiat above reservoirs and lakes during a summer pe is greater than that above coastal areas. The ference is approximately 5% and may be attribu to the presence of fewer clouds and a greate mospheric transparency above water bodies. observed values of albedo exceed the theoretic computed values whenever the altitude of the su greater than 30 deg and are smaller than the c puted values when the altitude of the sun is than 30 deg. Changes in absorbed and effec radiation point to their close relationship reveal their dependence upon the sun's altitud method is given for determining the water surf temperature, air temperature, and humidity ab a water body based on meteorological observat on the shore. The method makes it possible to culate the radiation balance of planned w bodies of various depth and size and to refine q titative descriptions of the hydrometeorolog regime of lakes and reservoirs. (Josefson-USGS
W71-09647

PHYSICAL (HYDRAULIC) MODELING HEAT DISPERSION IN LARGE LAKES: REVIEW OF THE STATE OF THE ART,
Minnesota Univ., Minneapolis. St. Anthony Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W71-09651

SEWDISH SCIENCE: SAYING WHAT SHOU BE DONE,
Lund Univ. (Sweden).
For primary bibliographic entry see Field 05G.
W71-09686

NEW LIFE FOR 'MINI-LAKE ERIES',
Wisconsin Dept. of Natural Resources, Madiso
For primary bibliographic entry see Field 05F.
W71-09693

MINERALIZATION OF ORGANIC PHOSPHORUS IN OLIGOTROPHIC LAKE SEDIMENTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 05C.
W71-09738

SPECIFIC COMPOSITION OF PHYTOPLANKTON IN A LAKE WARMED UP BY WASTE-WATER FROM A THERMAL POWER STATION AND IN LAKES WITH NORMAL TEMPERATURES,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
For primary bibliographic entry see Field 05C.
W71-09767

2I. Water in Plants

FLUORESCENT DYES, THEIR UPTAKE AND TANSLOCATION IN PLANTS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
D. E. Donaldson, and T. W. Robinson.
Water Resources Research, Vol 7, No 3, p 692-696, June 1971. 5 p, 2 fig, 1 tab, 13 ref.

Descriptors: *Tracers, *Dye releases, *Soil-water-plant relationships, *Tracking techniques, Fluorometry, Absorption, Moisture uptake, Translocation.
Identifiers: *Fluorescent dyes.

Of seven fluorescent dyes tested, rhodamine WT (RWT) and pontacyl brilliant pink (PBP) were the only two found to be suitable for tracer studies of water movements in plants. The results indicate that RWT is superior to PBP. The dyes were introduced in the aqueous form into the root zone of plants and were rapidly absorbed and transported to the leaves. The dosages were 1, 2, and 5 grams of dye per 32 kg of soil. With the largest dosage, the dye could be observed visually in the leaves. The concentrations of dye per gram of plant tissue ranged from 5 micrograms of PBP in oleander plants to 323 micrograms of RWT in fir plants. The time that elapsed from introduction of the dye into the soil until its detection in the leaves varied from 4 to 24 hours. Neither RWT nor PBP had produced any observable adverse effects when the plants were inspected up to 160 days after injection. Interference by the plant material in measuring the dye concentration was not a problem. (Knapp-USGS)
W71-09815

2J. Erosion and Sedimentation

THE FLOW OF WATER OVER AND WITHIN A PROTECTIVE LAYER OF COARSE, GRANULAR MATERIAL,
Mississippi State Univ., State College. Dept. of Agricultural and Biological Engineering.
For primary bibliographic entry see Field 08B.
W71-09558

THE SLOPE OF ABYSSAL PLAINS,
Flinders Univ., Bedford Park (Australia). Horace Lamb Center for Oceanographical Research.
John A. T. Bye.
Journal of Geophysical Research, Vol 76, No 18, p 4188-4194, June 20, 1971. 7 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Continental slope, *Sedimentation, *Slopes, *Density currents, *Turbidity currents, Suspended load, Sediment transport, Topography, Geomorphology, Mathematical models, Slope stability, Sedimentary structures, Oceanography.
Identifiers: *Abyssal plains.

If the abyssal plains have been formed by the transport of material in suspension flows, the slopes of the plains must be consistent with the dynamics of the flows. A solution of the momentum and conservation equations predicts a critical bottom slope below which the slopes are not self-sustaining in the presence of bottom friction even for particles with negligible fall speed. Two types of flow, in which either the depth or the concentration is held constant, both yield critical slopes of the order 1/1000. It appears that for slopes less than this value deposition of material must occur. The region of deposition may be shown to extend at least a few hundred kilometers. Thus suspension flow provides a suitable mechanism for the formation of surfaces with the observed range of abyssal slopes. (Knapp-USGS)
W71-09604

INTERSTITIAL DIFFUSION AND ADVECTION OF SOLUTE IN ACCUMULATING SEDIMENTS.,
Weizmann Inst. of Science, Rehvoth (Israel). Isotope Dept.
Y. Tzur.
Journal of Geophysical Research, Vol 76, No 18, p 4208-4211, Jun 20, 1971. 4 p, 1 tab, 7 ref.

Descriptors: *Mathematical models, Deposition (Sediments), *Connate water, *Diffusion, *Advection, Sedimentation, Water chemistry, Mixing, Sediment-water interfaces, Dispersion, Porous media.
Identifiers: Interstitial diffusion.

A mathematical model for diffusion and advection in accumulating sediments is presented. The model's influence on material transport and concentration is discussed; it is concluded that using simpler models by neglecting the advective terms is justified, but cases could arise in which these terms would be of importance. (Knapp-USGS)
W71-09606

DOES UPWARD DIFFUSION SUPPLY THE EXCESS MANGANESE IN PELAGIC SEDIMENTS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
Michael L. Bender.
Journal of Geophysical Research, Vol 76, No 18, p 4212-4215, Jun 20, 1971. 4 p, 3 fig, 1 tab, 17 ref.

Descriptors: *Manganese, *Bottom sediments, *Diffusion, *Sediment-water interfaces, *Water chemistry, Connate water, Sedimentation, Mixing, Dispersion, Porous media.

Simple calculations indicate that upward diffusion of Mn through pelagic sediment pore water can supply manganese at the rate it has been observed to accumulate in pelagic sediments (about 1 mg per sq cm per thousand years) only if manganese needs to be transported less than a meter or so in the sediment column. Data for manganese concentrations of sediment versus depth in the core indicate that the average thickness of the manganese-rich zone of pelagic sediments is at least 10 meters; therefore upward diffusion does not supply a large portion of the 'excess' manganese in most manganese-rich pelagic sediments. (Knapp-USGS)
W71-09607

CONSEQUENCES OF HISTORIC RAINFALL ON WESTERN IOWA FARMLAND,
Agricultural Research Service, Columbia, Mo. Soil and Water Conservation Research Div.
R. G. Spomer, H. G. Heinemann, and R. F. Piest.
Water Resources Research, Vol 7, No 3, p 524-535, Jun 1971. 12 p, 6 fig, 4 tab, 4 ref.

Descriptors: *Iowa, *Soil erosion, *Rainfall-runoff relationships, *Sheet erosion, *Erosion control, Storm runoff, Topography, Gully erosion, Historic flood, Cloud bursts, Cultivated lands, Damages, Land management, Sediment yield, Contour farming, Land forming, Terracing, Water control.
Identifiers: *Historic storm (Iowa).

Rainfall on five soil and water conservation watersheds near Treynor, Iowa, varied from 18 to 22 inches for the period of May 28 to June 27, 1967. This unique series of events has a return period that exceeds 100 years, based on the 97-year Weather Bureau record at nearby Omaha, Nebraska. Surface runoff from two corn cropped watersheds planted on an approximate contour approached or exceeded 50% of the storm rainfall during the period. Surface runoff was 8% or less for all rainfall events on a corn cropped, terraced watershed and 17% or less for all but one storm on a grassed watershed. These rains occurred a few weeks after planting when the corn crops were only 6 inches tall; consequently, little or no erosion protection was provided for the bare, loose soil. Sheet rill erosion rates were 75 to 100 tons per acre on the contoured watersheds. By contrast, conservation practices on two other watersheds limited the sheet rill erosion to 2.5 tons per acre. Gullies on the contoured corn watersheds eroded severly, whereas conservation practices on the other watersheds reduced gully erosion to an insignificant amount. (Knapp-USGS)
W71-09609

TRANSVERSE EROSIONAL MARKS OF MUD AND ROCK: THEIR PHYSICAL BASIS AND GEOLOGICAL SIGNIFICANCE,
Reading Univ. (England). Sedimentology Research Lab.; and Reading Univ. (England). Dept. of Geology.
J. R. L. Allen.
Sedimentary Geology, Vol 5, No 3-4, p 167-385, May 1971. 219 p, 106 fig, 441 ref, 11 tab.

Descriptors: *Sedimentary structures, *Ripple marks, *Scour, *Erosion, Turbidity currents, Open channel flow, Sedimentation, Waves (Water), Beaches, Sediment transport, Channel morphology, Bed load, Bottom sediments, sediment-water interfaces, Mass transfer, Aqueous solutions, Paleohydrology, Sedimentology.
Identifiers: *Transverse erosional marks.

Transverse erosional marks of interest in the earth sciences are described and classified as individual structures and as assemblages on the basis of their field occurrence and character. A theoretical and experimental investigation is made into the physical nature of the hydrodynamic and mechanical processes involved in their production, with particular reference to the flutes and scallops produced by solution in limestone caves, and to the scour and flute marks generated on mud beds by aqueous streams, notably turbidity currents, through corrasion and fluid-stressing. The association of transverse erosional marks with separated flows is established and the relevance of the properties of these flows to the shape and growth of the marks is demonstrated in detail. Alternative explanations of the size, shape and pattern of erosional marks are considered, and the changes in these properties down a turbidity current path are explored. No single theory of size, shape and pattern yet exists, though some generalizations are possible. Erosional marks generated on limestone surfaces by solution and on strong mud beds by corrasion depend for character on the defects existing in the bed, the duration of the eroding process, and the flow properties. However, structures produced by the fluid-stressing of weakly cohesive mud beds depend on flow properties alone. In both cases inferences of importance to environmental interpretations can be made from measurable properties of the structures. (Knapp-USGS)
W71-09624

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLENDE ROCK, II. THE WEATHERING OF HORNBLENDE,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 02G.
W71-09636

THE FORMATION OF STABLE SOLS FROM LAPONITE, A SYNTHETIC HECTORITE-LIKE CLAY,
Laporte Industries Ltd., Redhill (England).
For primary bibliographic entry see Field 02G.
W71-09639

THE INTERACTION OF KAOLINITE WITH POLYPHOSPHATE AND POLYACRYLATE IN AQUEOUS SOLUTIONS - SOME PRELIMINARY RESULTS,
English Clays Lovering Pochin and Co., Ltd., St. Austell (England). Central Labs.
For primary bibliographic entry see Field 02K.
W71-09640

THE DIFFERENTIAL THERMAL ANALYSIS OF FLOCCULATED CLAY SAMPLES,
Salford Univ. (England).
D. Dollimore, G. R. Heal, and T. A. Horridge.
Clay Minerals, Vol 8, No 4, p 479-486, December 1970. 8 p, 4 fig, 2 tab, 3 ref.

Descriptors: *Kaolinite, *Flocculation, *Aqueous solutions, *Organic compounds, *Differential thermal analysis, Gels, Colloids, Suspension, Sedimentation, Analytical techniques, Mineraology, Clays, Particle size.

Clays may be flocculated from suspension by various polymeric flocculating agents. In this study the technique of differential thermal analysis is used to identify the flocculating agent and to study its behavior when adsorbed on the clay particles. It is shown that the clay particles display normal properties on sedimenting in the presence of sufficient polymer to cause flocculation. The differential thermal analysis trace for clays is only affected when the flocculating agent is present on the surface in quantities in excess of that required for effective sedimentation. (Knapp-USGS)
W71-09641

JUSTIFICATION CHECK OF A METHOD FOR CALCULATING RESERVOIR-BANK TRANSFORMATION, AS WORKED OUT AT THE STATE HYDROLOGICAL INSTITUTE, AGAINST FIELD-OBSERVATION DATA (Russian: Proverka opravdyvayemosti metoda rascheta pereformirovaniya beregov vodokhranilishch, razrabotannogo v GGI, po materialam naturnykh nablyudeniy),
O. G. Grigor'yeva.
In: Hydraulic and Morphological Studies of Rivers and Water Bodies (Gidravliko-morfologicheskiye issledovaniya rek i vodoyemov), Gosudarstvennyy Ordena Trudovogo Krasnogo Znameni Gidrologicheskiy Institut Trudy, No 169; Gidrometeoizdat, Leningrad, p 101-122, 1969. 22 p, 3 fig, 2 tab, 7 ref.

Descriptors: *Reservoirs, *Bank erosion, *Scour, *Deformation, *Forecasting, Geomorphology, Erosion, Bank stability, Probability, Rocks, Slopes, Profiles, Waves (Water).
Identifiers: *USSR, *European USSR, Gor'kiy Reservoir, Volgograd Reservoir, Tsimlyansk Reservoir.

The dimensions of three large reservoirs in the European USSR are given and the nature of their banks briefly described. Bank erosion forecasts are made for 8 calculated profiles of the reservoirs--one for the Tsimlyansk reservoir, three for the Volgograd reservoir and four for the Gor'kiy reservoir. A comparison of observed bank erosions with those calculated by a method worked out at the State Hydrological Institute (SHI) shows an average deviation of 31% of the most probable scour with fluctuations ranging from 11 to 43%, which approximates the accuracy possible in such morphological calculations. In 5 of 8 cases examined the bank line displacement either occurred within the limits of potential erosion in the probability range of 1 to 99% or exceeded them by 1 to 3 m. In two instances the actual bank line displacement exceeded the upper limit of 1% probability by 6 m and only in one case did it exceed the upper limit by 15 m. In all cases the period of bank erosion observations was far below the minimum forecast period of record of 12.5 years stipulated by the SHI method. (Josefson-USGS)
W71-09648

EROSION AND SEDIMENTATION FOLLOWING ROAD CONSTRUCTION AND TIMBER HARVEST ON UNSTABLE SOILS IN THREE SMALL WESTERN OREGON WATERSHEDS,
Forest Service, Portland, Oreg. Pacific Northwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 04C.
W71-09655

SOIL PIPING AND STREAM CHANNEL INITIATION,
Experimental Cartography Unit, London (England).
Anthony Jones.
Water Resources Research, Vol 7, No 3, p 602-610, June 1971. 9 p, 3 fig, 2 tab, 41 ref.

Descriptors: *Soil water movement, *Surface-groundwater relationships, *Bank erosion, *Soil erosion, *Sand boils, Seepage, Percolation, Banks, Permeability stream erosion, Bank stability, Channel erosion.
Identifiers: *Soil piping.

Soil piping has been associated primarily with drylands, yet evidence of piping is available from a large range of climatic regions; in particular, it is found to be widespread in the United Kingdom. Preferred locations for piping are either just above or within a horizon of low relative permeability and low aggregate stability. Chemical environment may range from acidic moorland soils to saline marshes. There are significant trends to lower aggregate stability and coarser grain size. Many pipes in the areas studied appear to be dormant or relatively inactive and may well be in approximate equilibrium with the soil pore and channel subsystems. However, when equilibrium is destroyed (for example, by stream incision) pipes can form loci for channel extension. Studies of the spatial distribution of outlets show that to create normal channel networks, pipe clusters within the ensemble and, similarly, individual pipes within those clusters must be selected on an unequal basis. A low density random selection from pipes located on soil water flowlines would fulfill the requirements. The presence of piping may have a significant effect on the form of the hydrograph. (Knapp-USGS)
W71-09827

DATA ON THE GRANULOMETRY OF THE SURFICIAL SEDIMENT LAYER OF THE RAZELM-SINOE LAGOONAL COMPLEX (French: Donnees sur la granulometrie de la couche superficielle de sediments du complexe lagunaire Razelm-Sinoe),
Institute of Hydrotechnical Research, Bucharest (Rumania).
I. State, and I. Decu.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 158-164, 1970. 7 p, 2 fig, 1 tab, 4 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Sampling, *Deltas, *Lakes, *Sedimentation, *Sediment load, Aggradation, Silting, Sedimentary structures, Stratigraphy, Alluvium, Alluvial channels.
Identifiers: *Danube delta.

The lagoon complex Razelm-Sinoe by its origin and evolution is considered to belong to the Danube Delta, which is subject to intensive aggradation. Data were collected for a better understanding of the granulometry distribution of the deposits on the bottom of the main lake-basins of the complex (Razelm, Golovita, Sinoe). Deposits on the bottom of these lakes have both a mineral and biological origin. The main part is conveyed from the Danube river through the connecting channels and canals Dranov, Mustaca, Dunaval, and Fundea. The Dranov and Dunaval canals carry yearly into Razelm lake approximately 192.006 cu m of suspended load. Data obtained were used to draw up five cross profiles showing the percentage distribution of characteristic diameters and a map showing the plane distribution of the median diameter. (Knapp-USGS)
W71-09829

CHARACTERISTICS OF THE WATER FLOW INSIDE THE DANUBE DELTA,
Institute of Hydrotechnical Research, Bucharest (Rumania).
Constantin Diaconu, and Viorel Al. Stanescu.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 220-238, 1970. 19 p, 10 fig, 1 tab. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Streamflow, *Water storage, Runoff, Topography, Geomorphology, Lakes, Water levels, Water level fluctuations, Stage-discharge relations.
Identifiers: *Danube delta.

The hydrologic regime of the Danube Delta has some characteristics which have led to an original hydrogeologic method of investigation. Because of their close inter-relation, the morphological aspects have to be considered as parts of the same organic whole. Morphohydrographic elements can be divided into two distinct categories: (1) positive elements (soils of predeltaic origin, river and maritime ridges) and (2) negative elements (the hydrographical network and the depressions inside the delta). The depressions inside the delta play an importatnt part as an accumulation basin in the water circulation system between the arms and the interior of the delta. The principal water courses are: the main arms, the connecting channels between the arms and the inside of the delta, the connecting channels between the arms and the outside of the delta, and the connecting channels between the inside zones and the sea. These discharges on their way to the sea are modified by water storage inside the delta, by the rate of increase of the water levels and by the duration of high waters. This result was plotted as a diagram showing the differences between the discharges at the branching point and at the mouth of the arms, and the discharges at the apex of the delta. (Knapp-USGS)
W71-09830

TRANSFORMATION OF RIVER WATERS TO SEA WATERS AT RIVER MOUTHS,
State Oceanographic Inst., Moscow (USSR).
For primary bibliographic entry see Field 02K.
W71-09831

REMARKS ON THE REGIONAL GEOLOGICAL STRUCTURE OF THE NILE DELTA,
Egyptian Desert Inst., Cairo.
A. Shata, and I. El Fayoumy.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 189-197, 1970. 9 p, 13 fig, 9 ref (Also published in IASH Publication No 90, 1970).

Descriptors: *Structural geology, *Geologic control, *Geology, *Deltas, *Faults (Geology), Subsidence, Sedimentation, Geomorphology, Hydrogeology, Structure.
Identifiers: *Nile Delta.

The regional geological structure of the Nile Delta is a portion of a major downwarp zone characterizing the unstable shelf region of Northern UAR. This downwarp zone is affected by faulting, particularly in the southern porition. Within that portion two sets of faults are suspected; the NW set of

faults which account for the local development of a graben-like structure and the NE set of faults. Towards the northern edge of this downwarp zone, thrust faulting with a NE strike is expected. (K-napp-USGS)
W71-09832

THE NATURAL EQUILIBRIUM OF DELTAS (French: L'equilibre naturel des deltas),
Academia R.P.R., Bucharest. Hydrologic Commission.
A. C. Banu.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 184-188, 1970. 5 p, 7 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Water chemistry, Equilibrium, Climates, Geology, Geomorphology, Hydrogeology, Reviews, Environment, Alluvial channels, Channel morphology.
Identifiers: Delta growth.

The natural equilibrium of deltas is extremely unstable. It involves quantitative and qualitative relationship of stable proportion between climatic, geological and geomorphological, hydrological, chemical and biological processes. This equilibrium is maintained as long as the dynamic processes occurring in the deltaic environment are not modified as to their direction, intensity and frequency. The importance of the causal influence among these factors increases from the physico-chemical processes towards the biological ones. In its turn, the biologic factor influences the physico-chemical factors; however, the importance of this influence and of its effect on the content of the biotope varies with the evolution of the delta. A marked and rapid reversal of equilibrium takes place when man's intervention in the exploitation of deltas is made in opposition to the normal processes of evolution. (Knapp-USGS)
W71-09833

MORPHOLOGICAL AND HYDROLOGICAL CHARACTERISTICS OF LAKES OF THE DANUBE DELTA (French: Les caracteristiques morphologiques et hydrologiques des lacs du delta du Danube),
Institutal Geologic, Bucharest (Rumania).
Petre Gastescu.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 172-181, 1970. 10 p, 3 fig, 1 tab, 5 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Geomorphology, *Water balance, *Lakes, Sedimentation, Hydrology, Reviews, Hydrogeology, Surveys, Streamflow, Sediment load.
Identifiers: *Danube delta.

A short general description is given of the Danube delta as a morphological and physiographical unit. The Danube delta may be divided in two parts: fluvio-lacustrine, and lagoonal (marine). The morphobathymetrical characteristics and the hydrographical relations of the lakes with the main arms of the Danube are related to major features in the hydrologic regime, especially the hydrologic budget. The values of the water balance terms reflect the geographical zonality of precipitation and evaporation and the azonality of runoff. (K-napp-USGS)
W71-09834

HYDROLOGICAL PROCESSES IN OFFINGS AND THEIR ROLE IN FORMATION OF A DELTA FRONT,
State Oceanographic Inst., Moscow (USSR).
N. A. Skriptunov.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 164-172, 1970. 9 p, 6 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Geomorphology, Waves (Water), Hydrology, Sedimentary structures, Deposition (Sediments), Bed load, Suspended load, Stratigraphy, Tides, Topography, Sands.

The boundaries of the seaward parts of river mouths, zonation, classification, the factors determining type and the main factors determining the regime are considered together with river-mouth hydrological processes (water level, currents, turbidity, salinity, ice conditions, waves, etc.). The influences of hydrological conditions on the hydrological and morphological characteristics of delta branches are discussed. Changes in hydrological conditions under the influence of man-made structures are also considered. The delta front, as a result of interaction between river and sea, is the most dynamic type of shore. The factors determining the formation of the type of delta front are given, in particular for development of delta fronts with, prevalence of sea factors or with prevalence of river factors. The seasonal prevalences of river and sea factors, is the reason of the cyclic evolution of delta fronts. The role of man's activity in changing of delta fronts and delta bars is considered and the possibility of the forecasting of the type of delta front with an artificial mouth is discussed. (Knapp-USGS)
W71-09835

HYDROLOGIC-MORPHOMETRIC CHARACTERISTICS OF DELTA BRANCHES,
State Oceanographic Inst., Moscow (USSR).
V. N. Mikhailov.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 146-158, 1970. 13 p, 5 fig, 3 tab, 6 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Sediment transport, *Sedimentary structures, Hydraulics, Geomorphology, Channel morphology, Bed load, Sediment load, Equations.

The main hydrologic-morphometrical characteristics of delta branches are: water discharge; water level; mean elevation of bottom; water surface slope; mean flow velocity; cross-section area; channel width; mean depth; sediment discharge; mean sediment concentration; mean diameter of bottom sediments; Manning's coefficient of roughness. All hydrologic-morphometric characteristics of branches change both in time and in space. The main factors determining their variability are hydrological conditions at upper and lower boundaries of deltas (water discharge and sea level), channel processes in branches (erosion and accretion of bed), specific river mouth processes, interaction between sea and river waters, development of deltas, and local hydraulic conditions. Methods are given for estimation of hydrologic-morphometric characteristics of delta branches by hydrometric, hydraulic and hydrologic-morphometric equations. (Knapp-USGS)
W71-09836

HYDRAULIC THEORY FOR THE BOTTOM STREAM MOVEMENT OF THE RIVER BED SEDIMENT ON THE LANDWARD SIDE OF THE SHELF EDGE IN ESTUARIES,
Zakavkazskii Naucho-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
T. G. Vojnich-Sjanojensky, L. D. Gogeliany, and B. I. Kalandadze.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 128-137, 1970. 10 p, 8 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sediment transport, *Bed load, *Suspended load, *Turbidity currents, Turbulent flow, Waves (Water), Mud, Sedimentation, Dispersion, Mixing, Scour, Erosion.
Identifiers: Boussinesq equation.

A one-dimensional theory of movement is given for river flow with high sediment concentration over a river-bar and great drop in depth at the bottom of submerged canyons near the river mouth. One-dimensional hydraulic equations are deduced from the general dynamic equations for turbulent flow of liquids containing suspended solids. They are derived from equations of Saint-Venant-Boussinesq. An approximation of the friction mechanism is obtained by combining semi-empirical theories, taking in account the influence of the solids component on the intensity of turbulence and additional account of Coulomb friction on the dispersoid contact with the surface of the shelf edge. Using equations of dynamics and mass balance, the conditions of wave movement for the basal stream of a flow with high concentrations of sediment on a steep shelf edge are analyzed and modifications are derived for calculating velocities of dense streams with muddy characteristics on the bottoms of submerged canyons near the estuary. (Knapp-USGS)
W71-09837

FORMATION OF MODERN DELTA BRANCHES ON NON-TIDAL RIVERS WITH LARGE SEDIMENT DISCHARGE,
State Oceanographic Inst., Moscow (USSR).
S. S. Baydin.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 113-120, 1970. 8 p, 5 fig, 7 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Sediment load, Bed load, Deposition (Sediments), Geomorphology, Sediment discharge, Alluvial channels.

Formation of the distributary networks of non-tidal deltas with large sediment discharge is connected with breaking of natural levee. The complete cycle includes four stages: the lacustrine stage, the many-branched stage (within the delta), the single-branched stage, and the many-branched stage (seaward of the delta front). The duration of each stage depends on the amount of sediment transport, on the possibility of sedimentation in a flood plain or on the possibility of sedimentation at the place where the river flows into the sea. The variability of channel processes, the profile of the water surface and the water discharge distribution between the branches, the influence of man-made levees, and of base level change on the processes and the duration of the cycle and its stages are discussed. (Knapp-USGS)
W71-09838

SOME PROBLEMS OF MOVEMENT OF SOLID MATERIALS AND OF EROSION IN ESTUARIES AND DELTAS (French: Quelques problemes du mouvement des materiaux solides et de l'erosion dans les estuaires et les deltas),
Ghent Rijksuniversiteit (Belgium).
L. J. Tison, and G. Tison.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 101-112, 1970. 12 p, 9 fig, 6 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Sedimentation, *Tidal effects, *Estuaries, *Deltas, *Channel improvement, Currents (Water), Velocity, Silting, Bed load, Scour, Erosion, Waves (Water).
Identifiers: Channel changes.

Improvement of the lower part of a river can be the cause of important changes in the morphology of the estuary or the delta by facilitating of tidal

waves. This easier penetration causes both an increase in the flood volume and a reduction in time of the flood. The resulting growth in the velocity of the flood is not accompanied by a corresponding increase in the rapidity of the ebb, with the consequence that the solid materials have a marked tendency to be returned towards the upstream part of the delta region, where sedimentation increases. Local changes, even though in themselves insignificant, considerably change sharing of the flows between various arms, causing marked changes in the movement of materials, which could even lead to choking some arms. (Knapp-USGS)
W71-09839

ANCIENT DELTAS ON ROMANIAN TERRITORY (French: Deltas anciens sur le territoire de la Roumanie),
Pedagogical Inst., Suceava (Rumania); and Research Inst. for Land Reclamation and Soil, Bucharest (Rumania).
N. Popp, and D. Teaci.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 89-100, 1970. 12 p, 2 fig, 7 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Paleohydrology, Sedimentary structures, Lakes, Soil formation, Stratigraphy, Geomorphology, Climates.
Identifiers: *Romania.

In the extra-carpathian plains, especially in the Western Plain of Romania, are scattered a series of old deltaic plains, developed after the general drainage of the Panonic lake and of other lakes. The history of these deltas under different geomorphological, hydrogeological and climatic conditions, can be used to study evolution of the Danube Delta. For each of the old deltas (Somes, Crisuri, Mures, Timis-Bega, Dimbovita, Prahova, Siret) the present situation is characterized to explain chronologically their evolution and all the effects this evolution had on the development of the landscape as a whole, and on soil formation. (Knapp-USGS)
W71-09840

GEOPHYSICAL CONTRIBUTIONS TO THE STUDY OF THE GEOLOGIC EVOLUTION AND MORPHOGENESIS OF THE DANUBE DELTA (French: Contributions geophysiques a la connaissance de l'evolution geologique et de la morphogenese du Delta du Danube),
Institutul de Geogizica Applica, Bucharest (Rumania); and State Commission for Geology, Bucharest (Rumania).
Stefan Airinei, and Artemiu Pricajan.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 64-74, 1970. 11 p, 3 fig, 18 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Sedimentation, *Deltas, *Stratigraphy, *Topography, *Sedimentary structures, Geology, Geophysics, Geomorphology, Geologic control, Subsidence.
Identifiers: *Danube delta.

A correlation of the geophysical and geological data in the Danube delta shows (a) the structure of the deep basement, which is dislocated in steps, horsts, and grabens; (b) the structure of the immediate predeltaic basement; (c) the structural and erosional immediate basement invaded by the first paleo-euxinic transgression; (d) the trends of redistribution and sedimentation of the deltaic material. The W-E orientation is predominant in the structures of the deep basement, and in structures subordinate to the immediate basement, as well as in predeltaic morphological forms of the peninsular and insular system. The microrelief of the Delta inner ridges and littoral belts are approximately NE-SW. They were formed by redistribution and sedimentation of deltaic material under preponderent influences of maritime and eolian currents. (Knapp-USGS)
W71-09841

DELTAS OF THE ZONES CHARACTERIZED BY SINKING OF THE EARTH'S CRUST,
Akademiya Nauk SSSR, Moscow. Pochvennyi Institut.
V. V. Egorov.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 38-43, 1970. 6 p, 4 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Sedimentation, *Subsidence, Deposition (Sediments), Stratigraphy, Geomorphology, Alluvium, Alluvial channels, Coasts, Estuaries, Sea level, Bed load, Sediments.
Identifiers: *USSR.

The formation of deltas under conditions of crustal of sinking on the coasts of tideless water bodies is discussed. The Aralo-Caspian and Black Sea Coast deltas of the Kura, Terek, Kuban and Prut rivers as well as the paleodelta of the Volga can serve as an example of this type of delta. If the rate of sinking exceeds that of alluvium accumulation which is accompanied by delta withdrawal and intrusion of sea waters into a river valley, an estuary is formed. Under a slower process of delta sinking, the rate of alluvium accumulation exceeds that of sinking and a delta is formed. The formation of series of deposits and relief forms, the state of groundwater and the processes of modern salt accumulation in the deltaic regions are considered in relation to these two situations. (Knapp-USGS)
W71-09842

HYDROLOGY OF DELTA DEPOSITS IN GLACIATED VALLEYS IN NEW YORK,
Geological Survey, Orlando, Fla. Water Resources Div.
Leslie J. Crain.
In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 29-37, 1970. 9 p, 9 fig, 5 ref. (Also published in IASH Publication No 90, 1970).

Descriptors: *Deltas, *Aquifers, *Glacial drift, *New York, Sands, Clays, Lakes, Aquifer characteristics, Water storage, Water yield, Pleistocene epoch, Stratigraphy, Water resources development.
Identifiers: Jamestown (NY), Finger Lakes (NY).

Glaciated valleys in southwestern New York State contain thin layers of glaciofluvial sand and gravel interbedded in thick sequences of lacustrine material. These sand and gravel layers are important aquifers. The valleys also contain buried deltaic deposits adjacent to the valley walls. Streams that drained the uplands formed deltas in the pro- and post-glacial lakes in the valleys. Most of the delta deposits are in hydraulic contact with the glacial aquifers at depth; the deltas provide areas for recharge and reservoirs for storage of water. Wells that tap the glacial aquifers drain the stored water during summer and the water is replenished by precipitation and stream infiltration during winter and spring. Because of the relation of the delta deposits to the glacial aquifers the deltas have great potential for increasing groundwater yields through the manipulation of their water levels by pumping the glacial aquifers and by acting as temporary reservoirs to store excess streamflow during floods. Results of these studies apply to other regions in the western part of the state as they may to many other glaciated areas. (Knapp-USGS)
W71-09843

2K. Chemical Processes

A LABORATORY STUDY OF THE SOLUBLE METALS IN ROCK FROM THE BROAD QUADRANGLE, GEORGIA,
Georgia Inst. of Tech., Atlanta. Water Resources Center.
Charles A. Salotti.
Available from the National Technical Information Service as PB-200 656, $3.00 in paper copy, $0.95 in microfiche. Water Resources Center, Georgia Institute of Technology, Atlanta, June 1971, 11 p. OWRR Project A-021-GA (1).

Descriptors: *Soluble metals, *Granites, *Aqueous solutions, *Absorption, Magnesium, Calcium, Groundwater, Solubility, Georgia, *Solubility, Solutes, Analytical techniques, Spectrophotometry.
Identifiers: *Broad Quadrangle (Georgia), *Saprolite, Danburg granite.

The purpose of the study was to determine the solubilities of specific metals under controlled conditions from mineralogically and chemically studied rocks from the Broad Quadrangle, Georgia. Distilled deionized water was circulated in a non-contaminating system through crushed granite at controlled rates and temperature for a period of several months. The solubilities of calcium and magnesium were measured in the laboratory and compared with concentrations measured in the field. These comparisons showed that the natural concentrations of calcium and magnesium are much higher than those measured in the laboratory. The absence of dissolved carbon dioxide in the laboratory water was though to account partly for the low experimental concentrations, but not the large difference found. Colloidal and/or organo-metallic transport possible accounts for part of the discrepancy . (Conway-Georgia Tech)
W71-09466

PRECIPITATION OF PHOSPHATES FROM WATER WITH FERROUS SALTS,
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 05D.
W71-09555

NEW WATER DISINFECTANT: AN INSOLUBLE QUATERNARY AMMONIUM RESIN-TRIIODIDE COMBINATION THAT RELEASES BACTERICIDE ON DEMAND,
Kansas State Univ., Manhattan. Dept. of Chemistry; and Kansas State Univ., Manhattan. Div. of Microbiology.
For primary bibliographic entry see Field 05F.
W71-09562

EVALUATION OF THE MADISON LIMESTONE IN THE WILLISTON BASIN FROM WELL LOGS AND CORES,
Bureau of Mines, Laramie, Wyo., Energy Research Center.
For primary bibliographic entry see Field 02F.
W71-09595

THE SOLUBILITY OF CO2 IN WATER AND SEA WATER,
Harvard Univ., Cambridge, Mass. Hoffman Lab.
Yuan-Hui Li, and Tien-Fung Tsui.
Journal of Geophysical Research, Vol 76, No 18, 4203-4207, Jun 20, 1971. 5 p, 5 fig, 3 tab, 13 ref.

Descriptors: *Solubility, *Carbon dioxide, *Sea water, Salinity, Water temperature, Water chemistry, Chemical reactions, Aqueous solution, Equilibrium.

The solubility of CO2 in acidified sea water, Na solution, and distilled water have been redete mined in the laboratory using an infrared g analyzer technique. The observed solubility co

stants of CO2, in samples at different temperatures are tabulated. Each data point represents the average of two determinations. The reproducibility of data is within 0.5% or better. The most striking result is that alpha in 0.6413 m NaCl solution and in 20 Cl parts per thousand sea water are identical within experimental uncertainty (0.5%). This means that Bush's assumption is correct. (Knapp-USGS)
W71-09605

INTERSTITIAL DIFFUSION AND ADVECTION OF SOLUTE IN ACCUMULATING SEDIMENTS.,
Weizmann Inst. of Science, Rehvoth (Israel). Isotope Dept.
For primary bibliographic entry see Field 02J.
W71-09606

DOES UPWARD DIFFUSION SUPPLY THE EXCESS MANGANESE IN PELAGIC SEDIMENTS,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 02J.
W71-09607

A STATISTICAL METHOD FOR ANALYSIS OF DIFFUSION IN SOILS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02G.
W71-09615

EFFECT OF Mg (2..) ION ON THE SOLUBILITY OF SOLID CARBONATES,
Utah State Univ., Logan. Dept. of Soils and Meteorology.
. J. Hassett, and J. J. Jurinak.
Soil Science Society of America Proceedings, Vol 5, No 3, p 403-406, May-Jun 1971. 4 p, 5 fig, 1 ab, 15 ref.

Descriptors: *Carbonates, *Magnesium, *Dolomite, *Irrigation water, *Solubility, Aqueous olutions, Solutes, Leaching, Mineralogy, Chemical precipitation, Calcite, Water chemistry, Water quality, Salinity, Chemical potential.
dentifiers: Common ion effect, Sodium hazard.

The carbonate saturometer was used to determine he effect of Mg ion on the solubility of four different calcareous materials. It was found that a high rea calcite (about 13.5 sq m/g) had a higher solubility than a low area calcite (about .8 sq m/g) and hat the difference in surface areas of these calcites nodified the effect of Mg ion on their solubilities. The mineralogy of the solid carbonates can modify he effect of Mg ion on the solubility of the solid hase. Carbonates which contained appreciable Mg showed a decrease in solubility with increasing Mg ion, whereas carbonates with low or no Mg howed an increase in solubility. (Knapp-USGS)
W71-09616

SOTOPICALLY EXCHANGEABLE COBALT: HE EFFECT OF SOIL pH AND IONIC SATUATION OF THE SOIL,
Missouri Univ., Columbia. Dept. of Agronomy.
. L. Gille, and E. R. Graham.
Soil Science Society of America Proceedings, Vol 5, No 3, p 414-416, May-Jun 1971. 3 p, 1 fig, 4 ab, 12 ref.

Descriptors: *Soil chemistry, *Cobalt, *Aqueous olutions, Sudangrass, Tracers, Ion exchange, Absorption, Clay minerals, Chemical potential.

Large increases in the uptake of Co, Zn, and Mn by udangrass were observed when FeCl2, AlCl3, and aCl2 were added to the soil in which the plants ere grown. The isotopically exchangeable cobalt the soil remained unchanged regardless of the oil pH or the addition of Fe, Al or Ca to the soil. ncreases in the cobalt content of sudangrass result from changes in the soil solution concentration of cobalt in the soil rather than the quantity of cobalt. The effect of Fe, Al, and Ca additions and soil pH in producing the changes in cobalt content of sudangrass was caused by soil factors rather than changes in plant response. One-hundredth normal HCl is a useful extracting agent for determining the quantity of cobalt in the soil, and 0.1M CaCl2 gives the best indication of the potential soil solution concentration of cobalt in the soil. (Knapp-USGS)
W71-09617

CALCULATION OF THE LEACHING REQUIRED TO REDUCE THE SALINITY OF A PARTICULAR SOIL DEPTH BENEATH A SPECIFIED VALUE,
California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02G.
W71-09618

INTRODUCTION TO SYMPOSIUM--THE SOIL SOLUTION,
Agricultural Research Service, Auburn, Ala. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02G.
W71-09619

IONIC CONCENTRATIONS AND ACTIVITIES IN THE SOIL SOLUTIONS,
Auburn Univ., Ala. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 02G.
W71-09620

SOLUTION OF ION ACTIVITY AND PLANT GROWTH,
Tennessee Valley Authority, Muscle Shoals, Ala. Div. of Agricultural Development.
For primary bibliographic entry see Field 02G.
W71-09621

COMPUTATION OF SOIL SOLUTION COMPOSITION VARIATION WITH WATER CONTENT FOR DESATURATED SOILS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W71-09622

PROBLEMS ASSOCIATED WITH THE DETERMINATION AND APPLICATION OF THE SOLUBILITY PRODUCT CONSTANT,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02G.
W71-09623

A STUDY OF WEATHERING IN A SOIL DERIVED FROM A BIOTITE-HORNBLENDE ROCK, I. WEATHERING OF BIOTITE,
Macaulay Inst. for Soil Research, Aberdeen (Scotland).
For primary bibliographic entry see Field 02G.
W71-09635

THE ADSORPTION OF POLY (ETHYLENE GLYCOLS) ON CLAY MINERALS,
Adelaide Univ. (Australia). Waite Agricultural Research Inst; and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.
For primary bibliographic entry see Field 02G.
W71-09637

ADSORPTION OF WATER BY MONTMORILLONITE - POLY (ETHYLENE GLYCOL) ADSORPTION PRODUCTS,
Adelaide Univ. (Australia). Waite Agricultural Research Inst., and Adelaide Univ. (Australia). Dept. of Agricultural Biochemistry and Soil Science.
For primary bibliographic entry see Field 02G.
W71-09638

THE INTERACTION OF KAOLINITE WITH POLYPHOSPHATE AND POLYACRYLATE IN AQUEOUS SOLUTIONS - SOME PRELIMINARY RESULTS,
English Clays Lovering Pochin and Co., Ltd., St. Austell (England). Central Labs.
J. I. Bidwell, W. B. Jepson, and G. L. Toms.
Clay Minerals, Vol 8, No 4, p 445-459, December 1970. 15 p, 5 fig, 4 tab, 37 ref.

Descriptors: *Adsorption, *Kaolinite, *Phosphates, *Clay minerals, *Rheology, Flocculation, Electrolytes, Gels, Colloids, Clays, Viscosity.

The choice of kaolinite sample for surface chemical studies is examined. An adsorption apparatus, particularly suited for those studies where the adsorbate acts as a deflocculant, is described. Some preliminary results are given for the adsorption of total phosphate from tetrasodium pyrophosphate solutions and of polyacrylate from sodium polyacrylate solutions. The release of aluminum and silicon from the kaolinite was measured; with tetrasodium pyrophosphate, aluminum-phosphate complexes are formed. Competitive adsorption measurements suggest that the polyacrylate is adsorbed on the positively charged edges of the kaolinite. (Knapp-USGS)
W71-09640

DISTRIBUTION AND FORMS OF MERCURY IN GROUND-AND SURFACE WATERS IN A REGION OF MOLYBDENUM DEPOSITS (Russian: O rasprostranennosti i formakh nakhozhdeniya rtuti v gruntovykh i poverkhnostnykh vodakh v rayone molibdenovykh mestorozhdeniy),
Akademiya Nauk SSSR, Novosibirsk. Institut Geologii i Geofiziki.
For primary bibliographic entry see Field 05B.
W71-09644

BIOGEOCHEMICAL DISPERSION HALOS OF TIN IN A MONSOON CLIMATE OF THE SOUTHERN PART OF THE SOVIET FAR EAST (Russian: Biogeokhimicheskiye oreoly rasseyaniya olova v usloviyakh mussonnogo klimata yuga Dal'nego Vostoka),
Khabarovskii Kompleksnyi Nauchno-Issledovatelskii Institut (USSR).
For primary bibliographic entry see Field 05B.
W71-09645

EXTRACTION OF ANIONS AND CATIONS FROM RECENT VOLCANIC ASH,
Inter-American Inst of Agricultural Sciences, Turrialba (Costa Rica). Research and Training Center.
For primary bibliographic entry see Field 02G.
W71-09807

EFFECT OF ADDED SALT ON NITROGEN MINERALIZATION IN THREE CALIFORNIA SOILS,
California Univ., Davis. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 02G.
W71-09809

THE ROLE OF SPARINGLY SOLUBLE SOLIDS AND CATION EXCHANGE REACTIONS IN CONTROLLING CONDITIONS IN SOIL SOLUTIONS,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
For primary bibliographic entry see Field 02G.
W71-09810

TRANSFORMATION OF RIVER WATERS TO SEA WATERS AT RIVER MOUTHS,
State Oceanographic Inst., Moscow (USSR).
A. I. Simonov.

In: Hydrology of Deltas, Vol 1, Proceedings of the Bucharest Symposium, May 6-14, 1969: International Association of Scientific Hydrology-Unesco Co-edition, p 182-184, 1970. 3 p. (Also published in IASH Publication No 90, 1970).

Descriptors: *Water chemistry, *Mixing, *Deltas, Salinity, Turbidity, Sedimentation, Chemical precipitation, Water temperature, Reviews, Discharge (Water), Water circulation, Currents (Water), Density, Waves (Water), Estuaries.

The results of dynamic and chemical interaction between river and sea waters at the mouth (energy, suspended solids content, heat discharge, slight mineralization and salt balance) are discussed. River discharge is the leading factor of water mixing. Chemical exchange accompanies dynamic mixing. The laws of change of flow velocity, salinity, turbidity and water temperature during mixing are determined; the general equation of mixing includes a linear component to reflect dynamic mixing conditions and a non-linear component to reflect chemical transformations. The transformation of salt composition typical of river water to that typical of sea water is independent of the salinity of sea water. These laws facilitate investigation and explanation of the hydrological and hydrochemical processes taking place at river mouths. They can also be applied to studies of the dynamics of substances relevant to pollution. (Knapp-USGS)
W71-09831

2L. Estuaries

A WATER RESOURCE-WATER SUPPLY STUDY OF THE POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-09788

A COMPREHENSIVE STUDY OF SAN FRANCISCO BAY,
California. University of Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05A.
W71-09790

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES. PART I. EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES.
Quirk, Lawler and Matusky Engineers, New York.
For primary bibliographic entry see Field 05B.
W71-09791

ESCAROSA: A PRELIMINARY STUDY OF COASTAL ZONE MANAGEMENT PROBLEMS AND OPPORTUNITIES IN ESCAMBIA AND SANTA ROSA COUNTIES, FLORIDA.
Florida Coastal Coordinating Council, Tallahassee.

Florida Coastal Coordinating Council Report, Tallahassee April 1971, 29 p, 7 fig, 3 tab, 98 ref.

Descriptors: *Florida, *Coasts, *Zoning, *Estuaries, *Environmental effects, Soils, Human population, Economics, Land use, Waste disposal, Erosion, Water quality, Dredging, Landfills, Agriculture.
Identifiers: *Escambia County, *Santa Rosa County.

The Coastal Coordinating Council was charged by the 1970 Florida Legislature to develop a plan for the protection, development and zoning of the coasts of Florida. Escarosa (Escambia and Santa Rosa Counties) was selected as a preliminary project as an overview of the principal problems of Coastal Zone management. These problems are typical of most populated coastal areas of Florida. The Northwest Florida Regional Coastal Management Plan will be the first in a series of regional plans which will be developed for the entire Florida Coast. Natural environmental characteristics, socio-economic characteristics, environmental problems and management practices are discussed. (Ensign-PAI)
W71-09794

STUDIES OF ESTUARINE DEPENDENCE OF ATLANTIC COASTAL FISHES,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Marine Lab.
For primary bibliographic entry see Field 05C.
W71-09800

HYDRAULIC THEORY FOR THE BOTTOM STREAM MOVEMENT OF THE RIVER BED SEDIMENT ON THE LANDWARD SIDE OF THE SHELF EDGE IN ESTUARIES,
Zakavkazskii Naucho-Issledovatelskii Gidrometeorologicheskii Institut, Tiflis (USSR).
For primary bibliographic entry see Field 02J.
W71-09837

SOME PROBLEMS OF MOVEMENT OF SOLID MATERIALS AND OF EROSION IN ESTUARIES AND DELTAS (French: Quelques problemes du mouvement des materiaux solides et de l'erosion dans les estuaires et les deltas),
Ghent Rijksuniversiteit (Belgium).
For primary bibliographic entry see Field 02J.
W71-09839

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

A BASIC STUDY OF FERROUS MATERIALS FOR DESALINATION EQUIPMENT,
Case Western Reserve Univ., Cleveland, Ohio.
For primary bibliographic entry see Field 08G.
W71-09746

3B. Water Yield Improvement

EVAPOTRANSPIRATION AND ITS CHEMICAL REDUCTION,
Kansas State Univ., Manhattan. Water Resources Research Inst.
For primary bibliographic entry see Field 02D.
W71-09556

A COMPREHENSIVE REPORT ON NINETEEN CONDENSATION NUCLEI. PART II,
Atmospheric Sciences Lab, White Sands Missile Range, N.Mex.
Richard D. H. Low.
Available from the National Technical Information Service as AD-721 591, $3.00 in paper copy, $0.95 in microfiche. U.S. Army ECOM Report 5358, Jan 1971. 260 p.

Descriptors: *Artificial precipitation, *Nucleation, *Cloud seeding, *Weather modification, Clouds, Nitrates, Iodides, Sulfates, Fog, Condensation.
Identifiers: Chlorides, Bromides, *Condensation nuclei, Hygroscopicity, Cloud physics.

This is Part II of 'A Comprehensive Report on Nineteen Condensation Nuclei,' which contains tabulations of the growth times of these nuclei under various assumed supersaturations. The growth time of each nucleus at a given super saturation is obtained from a newly developed growth rate equation which utilizes a single parameter to denote the hygroscopicity of the nucleus and which includes an additional term to reflect the inefficiency of the condensation process. This volume and its predecessor serve as a valuable reference for the experimental cloud physicist in his study of the growth behaviors of condensation nuclei and for the field cloud physicist in his selection of the proper artificial nuclei for warm fog or cloud modification.
W71-09576

PREDICTING WELL YIELDS - TWO CASE HISTORIES,
Patchick Consulting Hydrogeologist, White Bear Lake, Minn.
P. F. Patchick.
Groundwater Vol 5, No 2, p 41-53, April 1967, 6 tab, 6 fig, 3 photo, 26 ref.

Descriptors: *Water wells, *Groundwater, Aquifer characteristics, Logging (Recording), Specific capacity, Screens.
Identifiers: *Permeability estimates (Wells), Drill cutting.

Two case histories are presented which illustrate that by analyzing drill cuttings or bailed samples, by knowing total depth of a test hole and position of the static water level, and by studying the driller's log, not only can a well's yield be predicted - but also drawdown may be predicted for any well in advance of a pumping test. The estimation of specific capacity (gpm/ft of drawdown) is invaluable in well design, particularly in the United States, where drilling contractors work rapidly and efficiently. Knowledge of probable specific capacity can aid in recommending proper screen length, diameter, slot width, and setting. It will enable cost estimates for proper pump size to be made, for casing requirements to be determined, and also for ultimate well diameter and depth to be determined. Test-pump setting can also be anticipated. Six figures are included showing well construction details, sieve analysis curves, a semi-log plot of recovery measurements obtained during an aquifer pumping test, and graphic representations of approximate permeabilities for granular materials ranging from clay/silt to fine gravel. Six tables give characteristics of samples recovered from two test wells permeability estimates of the disturbed samples approximate permeabilities of various granular materials, and specific capacities for 100 percent effective water wells with varying diameters, coefficients of storage, and pumping periods. Three photographs further illustrate the principles enumerated. The methods described can give acceptable results (although they may not be as spectacular as the two detailed case histories) if sound judgment is used; if local conditions are somewhat known; if sampling methods are described; and if the procedures are not abused by expecting extreme accuracy. A reasonable estimate, or perhaps 'guesstimate' is all that should be hoped for by the hydrogeologist. (Campbell-NWWA)
W71-09733

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 06A.
W71-09735

3C. Use of Water of Impaired Quality

FEASIBILITY STUDY FOR GLENDALE - LOS ANGELES WATER RECLAMATION PLANT.
Engineering Science, Inc., Los Angeles, Calif; and Koebig and Koebig, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 05D.
W71-09590

SUPPLEMENTAL IRRIGATION WITH STREAM WATER CONTAMINATED BY ACID MINE DRAINAGE,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
Richard W. Terkeltoub.
Water Resources Research, Vol 7, No 3, p 704-708, June 1971. 5 p, 2 fig, 1 tab, 3 ref.

Descriptors: *Acid mine water, *Irrigation water, *Pennsylvania, Water pollution control, Iron, Hydrogen ion concentration, Water utilization, Flooding, Water chemistry, Soil-water-plant relationships, Water quality, Sampling, Impaired water quality.

Many streams in the Appalachian coal producing region, which could furnish supplemental irrigation water, are polluted with acid mine drainage. They consequently contain much greater trace concentrations and have lower pH than do nearby streams that carry only agricultural drainage. Nevertheless, supplemental irrigation of barley plants grown in a greenhouse with acid mine water was as beneficial to plant growth as supplemental irrigation with deionized water. The capacity of the soil to buffer pH and adsorb trace metals apparently counteracts the properties of acid mine water, which are detrimental to plant growth. Furthermore, the agricultural quality of a field often flooded with acid mine water has been maintained by adding lime to offset the reduced pH. Thus under certain soil conditions and management practices, acid mine water can be used for supplemental irrigation. (Knapp-USGS)
W71-09816

3D. Conservation in Domestic and Municipal Use

CHARACTERISTICS OF HOUSEHOLD WATER CONSUMPTION IN THREE NEW HAMPSHIRE COMMUNITIES (APPENDIX),
New Hampshire Univ., Durham. Water Resources Research Center.
For primary bibliographic entry see Field 06D.
W71-09563

DROUGHT AND WATER SUPPLY - IMPLICATIONS OF THE MASSACHUSETTS EXPERIENCE FOR MUNICIPAL PLANNING,
Resources for the Future, Washington, D.C.; and Pittsburgh Univ., Pa. Dept. of Geography; and Clark Univ., Worcester, Mass. Dept. of Geography.
For primary bibliographic entry see Field 06D.
W71-09652

PRESENT OPERATIONAL PROBLEMS AND FUTURE WATER SUPPLY NEEDS IN ANKARA, TURKEY,
Camp, Dresser and McKee, Boston, Mass.
Robert C. Marini.
Journal of the New England Water Works Association, Vol 84, No 3, p 298-308, Sept 1970. 1 fig.

Descriptors: *Water supply, *Water demand, *Project planning, *Economic feasibility.
Identifiers: *Ankara, Turkey, Camp-Harris-Mesara, Cubuk, Kayas-Bayindir Dam, Kurtbogazi reservoir.

This article summarizes the findings and recommendations of a comprehensive study of the critical water supply problems in Metropolitan Ankara, Turkey, made in 1969. It discusses present and future water needs, describes the existing water supply and distribution system, and outlines a recommended five-stage, $420 million water supply improvement program. (Holmes-Rutgers)
W71-09694

A UTILITY COMPANY'S FIRST STEP INTO THE WORLD OF COMPUTERS,
Brockton Edison Co., Miss.
Patrick J. Murray, and Thomas H. Warner.
Journal of the New England Water Works Association, Vol 84, No 3, p 309-324, September 1970.

Descriptors: *Utilities, Computers, Economics, Data processing, Administration.
Identifiers: Multi-Function Card Machine.

This article discusses the factors to be considered when a utility company is contemplating introduction of computers. Specifically, personnel, design, manufacturer, conversion, timing, and training are described. (Holmes-Rutgers)
W71-09695

PUBLIC WATER SUPPLY SYSTEMS.
American Water Works Association, New York.

In: Public Facility Needs, Washington, US Government Printing Office, 1966, p 105-124.

Descriptors: *Water supply, *Public utility, *Investment, *Capital costs, Water treatment, Water distribution, Population, Financing, Government supports.
Identifiers: *Plant facilities, Performance standards, Water utility cost indexes, Operations, Maintenance.

This article presents a comprehensive survey of the public water supply utility industry. The nature and composition of the industry is broken down into a description of the physical characteristics, the services rendered, the standards of performance, and the existing capital plant. The costs and user charges are then dealth with, particular attention being given to construction costs, incremental costs of water facilities, typical water utility cost indexes, plant investment, and annual expense of operations and maintenance. The water utility financing and user charges incorporates explanations of both self-supporting enterprises and tax-supported enterprises. Trends in capital outlays are indicated, and projections are made for water industry needs and prospective capital outlays, in terms of population growth, depreciation, deficiencies, water rates, private investment capital, and federal assistance programs in the future. (Murphy-Rutgers)
W71-09867

3E. Conservation in Industry

WATER IN THE CHEMICAL INDUSTRY,
D. F. Othmer.
Chemical and Process Engineering, p 142-144, Vol 5, No 6, June 1970.

Descriptors: *Water supply, *Water reuse, *Economics, Cost comparisons, *Desalination, Columbia River, Mississippi River.
Identifiers: Controlled flash evaporation system, Rhine River, Egypt.

This article reviews the options available for increasing the supply of water especially for industrial uses. The author specifically describes the importance and economics of desalination and predicts that 'possibly by 1975' desalinated water may be available to large seacoast cities at a cost as low as $0.35 - 0.40/1,000 gallons. He maintains that dual water systems although 'prohibitively expensive for existing cities' should be considered for new urban construction. He discusses the various primary, secondary and tertiary treatments of waste waters and encourages water reuse in the chemical industries. (Holmes-Rutgers)
W71-09690

3F. Conservation in Agriculture

A NEW APPROACH TO DRAINAGE,
Department of Agriculture and Fisheries for Scotland, Edinburgh.
J. P. Struthers.
Scottish Agriculture, Vol 49, No 2, p 68-71, Spring 1970. 1 reference.

Descriptors: *Drainage programs, Land reclamation, Cost comparisons, Drainage engineering.
Identifiers: *Scotland, England, Macaulay Institute for Soil Research.

By using new methods of drainage, the costs of land reclamation can be substantially reduced. Several schemes are described which could be employed to improve much of Scotland's arable and grass land. (Holmes-Rutgers)
W71-09477

CENTRIFUGAL PUMPS - ECONOMIC IMPLICATIONS OF SELECTION,
Gujarat Cooperative Executive Development Centre, Ahmedabad (India).
S. M. Patel.
Indian Farming, Vol 20, No 9, p 39-41, Dec 1970. 51, 1 table.

Descriptors: *Irrigation practices, Irrigation efficiency, Cost comparisons, Economics.
Identifiers: *India, Ramlal, Fourth Five - Year Plan.

Indian farmers and therefore the agriculture of the country could benefit by careful selection of proper mechanized lift irrigation equipment. Indian farmers do not consider when purchasing centrifugal pumps whether the pump is well made or whether the pump matches the well on which it is to be installed. Pump manufacturers should hire technically trained salesmen to assist the farmer in his purchase. (Holmes-Rutgers)
W71-09478

A TECHNIQUE FOR IRRIGATING BOTTOM LAND HARDWOOD TREES WITH PAPERMILL EFFLUENT IN NORTH LOUISIANA,
Louisiana Polytechnic Inst., Ruston.
For primary bibliographic entry see Field 05D.
W71-09527

THE EFFECT OF IRRIGATION WITH MUNICIPAL SEWAGE EFFLUENT AND SLUDGE ON SELECTED TREES, GRASSES, AND LEGUMES PLANTED IN BITUMINOUS STRIP-MINE SOIL,
Pennsylvania State Univ., University Park. Dept. of Forestry and Wildlife.
For primary bibliographic entry see Field 05D.
W71-09529

USE OF SOIL TO TREAT ANAEROBIC LAGOON EFFLUENT: DESIGN AND OPERATION OF A FIELD DISPOSAL SYSTEM,
Iowa State University, Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-09538

GROWING CORN IN GROWTH CHAMBERS WITH DIFFERENT MANURE TREATMENTS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
Eugene Goering, R. I. Lipper, and H. L. Manges.
Unpublished Paper, Presented 1971 Mid-Central Meeting American Society of Agricultural Engineers, Paper No MC-71-104, 17 p, 10 tab, 6 ref.

Descriptors: *Farm wastes, *Crop response, Disposal, Laboratory tests, Plant tissues, Growth chambers, Cattle.
Identifiers: Manure, Application rates, Contamination.

The purpose of this experiment was to determine the effect on corn germination and early growth of different manure loading rates and to compare the effect of planting in manure mixed with soil against placement of seed above a manure layer. Germination and early growth of corn in plant growth chambers were adversely affected by applications of beef feedlot manure at rates ranging from 35 to 175 tons/acre, oven dry basis. The effects were dif-

ferent when manure was completely mixed with soil than when applied as a layer under a soil cover. (Christenbury-Iowa State)
W71-09748

POLLUTION, PESTICIDES AND THE PEOPLE -- AGRICULTURE AND OUR NATURAL ENVIRONMENT.
Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept.
For primary bibliographic entry see Field 05C.
W71-09752

THE FARMERS' CONCERN,
For primary bibliographic entry see Field 05C.
W71-09756

PESTICIDES,
Environmental Protection Agency, Washington, D.C. Pesticide Advisory Committee,
For primary bibliographic entry see Field 05C.
W71-09758

LIVESTOCK WASTE,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-09759

AGRICULTURAL BENEFITS FROM URBAN POLLUTION CONTROL,
Office of the Secretary of the Army, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-09764

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SECOND VOLUME.
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06A.
W71-09465

FLOOD DAMAGE ABATEMENT STUDY FOR VIRGINA,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06F.
W71-09467

POLITICAL AND SOCIAL BARRIERS TO WESTERN WATER DEVELOPMENT,
Idaho Univ., Moscow.
William E. Folz.
Strategies for Western Regional Water Development, Proceedings of the Western Interstate Water Conference, Corvallis, Oregon, p 72-95, 1965. 24 references.

Descriptors: *Water supply, Economics, Political aspects, Pricing, Market value.
Identifiers: *Kenneth Boulding - California Water Plan, Interagency Committee Report, TVA, Pacific Southwest Water Plan, Senate Bill 1275, U.S. Bureau of Reclamation.

If political and social barriers were to be controlled Western Water Resources would be developed satisfactorily. It would assume that market determination of water utilization would be the use to which the water could be applied. For the most part, the economic studies in the past ten years support this thesis. When we accept this form of criteria, we lose the political compromise and expendiency. People must be willing to pay collectively for the adequate supply of water. The models should be based on a certain market value. (William Campbell-Rutgers)
W71-09483

TRANSIENT SEEPAGE FLOW TOWARD TWO PARALLEL DRAINS,
Wisconsin Univ., Madison. Dept. of Mechanics; and Wisconsin Univ., Madison. Dept. of Physics; and Wisconsin Univ., Madison. Water Resources Center.
Imre Gyuk, and Gabor M. Karadi.
(1971), 16 p, 7 fig, 2 ref. OWRR Project A-029-WIS (1).

Descriptors: *Tiles, *Tile drainage, *Free surfaces, *Seepage, *Flow.
Identifiers: *Conformal mapping, *Transient seepage, *Computation, Partial differential equations.

The method of conformal mapping is applied to the analysis of transient seepage flow toward two parallel drains in a semi-infinite aquifer taking into consideration the non-linear boundary condition on the free surface. The mapping function is expressed as the power function of time and the seepage domain is mapped onto a domain of an auxiliary complex variable in such a manner that the free surface will always remain the real axis. The solution is first obtained to a single drain by neglecting the terms of the fourth on higher order. Then the solution is extended to two parallel drains by using the method of images. Calculations are carried out for different ratios of drain depth to drain spacing using various drain diameter to drain depth ratios.
W71-09560

FLOOD PLAIN INFORMATION, LENOIR, NORTH CAROLINA, LOWER CREEK, BLAIR FORK, LONG BRANCH, ZACKS FORK CREEK AND ZACKS FORK BRANCH.
Corps of Engineers, Charleston, S.C.

Army Corps of Engineers Flood Plain Report, May 1970. 72 p, 29 fig, 20 plate, 13 tab.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood.
Identifiers: *Lenoir (NC), Standard Project Flood, Intermediate Regional Flood.

Flooding of Lenoir, North Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occurred and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The 1940 Flood is estimated to have crested throughout the study area at stages approximately equivalent to those that would be reached by Intermediate Regional Flood. Major floods have occurred with about the same frequency on Blair Fork, Long Branch, and Lower Creek. (Woodard-USGS)
W71-09600

FLOOD PLAIN INFORMATION, TINKERS CREEK, TWINSBURG, SUMMIT COUNTY, OHIO.
Corps of Engineers, Buffalo, N.Y.

Army Corps of Engineers Flood Plain Report, April 1970. 57 p, 44 fig, 10 plate, 9 tab.

Descriptors: *Floods, *Flood plains, *Flood damage, *Ohio, Regional flood, Historic flood, Flood forecasting, Design flood, Flood control.
Identifiers: *Tinkers Creek (Summit County-Ohio), Standard Project Flood, Intermediate Regional Flood.

Flooding along Tinkers Creek in Summit County, Ohio is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections, and text material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights and other technical data. The stage of 10.1 feet recorded at Bedford July 20, 1969 was the maximum stage of record since the gage was installed in 1962. The storm was centered approximately 3 miles southwest of the Bedford gage. Of the 5.60 inches of rain that fell in this area during a 24-hour period, the majority was recorded between 11:15 a.m. and 1:15 p.m. Since the stream slopes of the main stem and tributaries are fairly steep in this region, the majority of this precipitation was rapidly transported to the Bedford gage, peaking at 4:30 p.m. (Woodard-USGS)
W71-09601

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1971.
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W71-09628

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 06A.
W71-09735

A CASE STUDY OF WATER RESOURCES DEVELOPMENT - AN ANALYSIS OF A PROPOSED PROJECT ON THE MISSOURI RIVER,
Cornell Univ., Ithaca. Water Resources and Marine Sciences.
For primary bibliographic entry see Field 06B.
W71-09740

MANAGEMENT OF WATER QUALITY IN RELEASES FROM SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
Herman M. Clay, Jr., and E. Gus Fruh.
(1971), 22 p, 7 fig, 2 tab, 20 ref. OWRR Project B-040-TEX (2).

Descriptors: Stratification, *Withdrawal, *Impoundments, Water quality, Reservoirs, Water utilization, *Water management (Applied), Discharge (Water), Model studies.
Identifiers: *Selective withdrawal, Southwestern US, Bohan-Grace solution.

The objective was to determine the selectivity of withdrawal which is possible in southwestern reservoirs. Two stratified flow solutions were examined to test their applicability under field conditions. Although both appeared capable of accurate prediction of the outflow velocity profile, the Bohan-Grace solution, which required less input data, was utilized to predict the chemical constituents of single and simultaneous releases from several southwestern impoundments. Prediction of outflow water quality was within fifteen percent for southwestern reservoirs as shallow as fifty-five feet. The withdrawal layer thickness for the subject Texas impoundments included the entire hypolimnion or epilmnion depending on outlet location. The sensitivity of the velocity profile to seasonal changes, reservoir discharge rate and withdrawal port dimensions also is illustrated. (See also W71-06193 and W71-09743)

W71-09742

SELECTIVE WITHDRAWAL AS A WATER QUALITY MANAGEMENT TOOL FOR SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
E. Gus Fruh, and Herman M. Clay, Jr.
(1971), 22 p, 8 fig, 2 tab, 13 ref. OWRR Project B-040-TEX (3).

Descriptors: Stratification, *Withdrawal, *Impoundments, Water quality, Reservoir, Water utilization, *Water management (Applied), Discharge (Water), Model studies.
Identifiers: *Selective withdrawal, Southwestern US, Bohan-Grace solution.

The objective was the development of a preliminary simulation model of impoundment water quality that included an accurate description of stratified flow and selective withdrawal. Two stratified flow solutions were examined to test their applicability to describe reservoir withdrawal hydraulics under field conditions. Although both appeared capable of accurate prediction of the outflow velocity profile, the Bohan-Grace solution, which required less input data, was selected allowing application to impoundments for which field data are minimum. The simulation model, including the Bohan-Grace solution for reservoir withdrawal hydraulics, was assessed for a two-year period for which sufficient field data were available. The error in penstock temperature prediction ranged from 0 to 5F. (See also W71-06193 and W71-09742)
W71-09743

FLOOD PLAIN INFORMATION, MORGANTON, NORTH CAROLINA - VOLUME 2. CATAWBA RIVER, SILVER CREEK AND BAILEY FORK.
Corps of Engineers, Charleston, S.C.

Army Corps of Engineers Flood Plain Report, January 1970. 54 p, 9 fig, 16 plate, 14 tab.

Descriptors: *Floods, *Flood damage, *North Carolina, Flood plains, Flood control, Non-structural alternatives, Maximum probable flood, Historic flood.
Identifiers: *Morganton (North Carolina), Standard Project Flood, Intermediate Regional Flood.

Flooding of Catawba River, Morganton, North Carolina is described in a report of flood plain problems based on records of rainfall, runoff, and historical and present flood heights. Maps, photographs, profiles, and cross sections indicate the extent of flooding that has occured and which may be expected to occur in the future. The information is for use in study and planning ways to minimize vulnerability to flood damages by control of flood plain use by zoning and subdivision regulations, the construction of flood protection works, or by combinations of these approaches. The largest known flood recorded on the Catawba River in the Morganton area occurred in July 1916. The river rose at Morganton to about 41 feet above normal at the foot of Green Street, 17 feet above the highest water ever before recorded there. (Woodard-USGS)
W71-09845

FLOOD PLAIN INFORMATION, ALBUQUERQUE ARROYOS, PART 1, ALBUQUERQUE, NEW MEXICO.
Corps of Engineers, Albuquerque, N. Mex.

Army Corps of Engineers Flood Plain Report, June 1970. 34 p, 5 fig, 11 plate, 1 tab.

Descriptors: *Floods, *Flood damage, *Flood plains, *Urbanization, *New Mexico, Regional flood, Flood forecasting, Flood control.
Identifiers: *Albuquerque (N Mex), Standard Project Flood, Intermediate Regional Flood.

Flooding along the numerous Arroyo Channels in or adjacent to the City of Albuquerque, New Mexico is described to aid in solving local flood problems and in planning the best utilization of flood-prone lands. Maps, profiles, cross sections and other material relating the extent of past flooding to floods which might occur in the future are based on available records of rainfall, runoff, historical flood heights, and other technical data. Application of loss rates used in the design of the Albuquerque North Diversion Channel to the critical distribution of 100-year rainfall amounts will produce a total runoff of 1.92 inches over a 6-hour period; rainfall losses would be 0.50 inches for the first hour and 0.16 inches per hour for subsequent periods. For study purposes, all mesa areas were assumed to be developed. (Woodard-USGS)
W71-09846

4B. Groundwater Management

A PRELIMINARY 'LEAST COST' STUDY OF FUTURE GROUNDWATER DEVELOPMENT IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 05D.
W71-09539

HYDRAULIC TESTING AND SAMPLING OF WATER WELL NUMBER 1, PROJECT WAGON WHEEL, SUBLETTE COUNTY, WYOMING,
Geological Survey, Denver, Colo.
Paul T. Voegeli, Sr.
Geological Survey Open-file Report, USGS-474-87 (AEC), March 1971. 26 p, 7 fig, 3 tab, 2 ref. USAEC Agreement No AT (29-2)-474.

Descriptors: *Hydrogeology, *Aquifer characteristics, Water wells, Transmissivity, Specific capacity, On-site tests, Water yield, Water levels, Drawdown, Water supply, Data collections, Sampling, Hydrologic data.
Identifiers: Pumping tests, *Aquifer tests.

The Wagon Wheel Water Well No. 1 was drilled to obtain hydraulic data and to provide a water supply for the deep drilling program at the site of Project Wagon Wheel, which is aimed at determining the feasibility of nuclear stimulation of natural gas reservoirs. The well was tested and water samples were collected by swabbing on August 1, 1969, and by pumping on August 26, 1969. In both tests the 760-meter section through which the well was drilled was tested through 19 gun-perforated intervals. The water level in the well prior to the pumping test was 29.9 meters below land surface. During the pumping test the water level declined to 47.7 meters below land-surface datum while the well was pumped at an average rate of 281 cubic meters per day for 6 hours and 6 minutes. The transmissivity of the aquifer in the vicinity of the well was 26 cubic meters per day per meter and the specific capacity was 16 cubic meters per day per meter of drawdown. (Knapp-USGS)
W71-09593

HYDROGEOLOGY OF THE CARBONATE ROCKS OF THE LANCASTER 15-MINUTE QUADRANGLE, SOUTHEASTERN PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 02F.
W71-09594

EVALUATION OF THE MADISON LIMESTONE IN THE WILLISTON BASIN FROM WELL LOGS AND CORES,
Bureau of Mines, Laramie, Wyo., Energy Research Center.
For primary bibliographic entry see Field 02F.
W71-09595

GROUNDWATER RECONNAISSANCE STUDY OF SELECTED SITES IN ROCKY MOUNTAIN NATIONAL PARK AND SHADOW MOUNTAIN NATIONAL RECREATION AREA,
Geological Survey, Denver, Colo.
Frank A. Welder.
Geological Survey Open-file Report 71001, March 1971. 47 p, 16 fig, 3 tab, 5 ref.

Descriptors: *Water resources development, *National parks, *Colorado, *Water wells, *Water yield, Water supply, Geology, Hydrogeology, Hydrologic data, Data collections.
Identifiers: *Rocky Mountain National Park, *Shadow Mountain Recreation area.

The groundwater supply potential at 30 sites within the Rocky Mountain National Park and Shadow Mountain National Recreation Area was evaluated by the U.S. Geological Survey in 1967 and 1968. The work consisted of a geohydrologic reconnaissance, well inventory, and test drilling. The sites are underlain by Precambrian crystalline rocks, Tertiary sediments, or Quaternary glacial and alluvial deposits. The crystalline rocks are generally poor aquifers; some wells intercepting fractures may yield as much as 10 gallons per minute from wells 100 to 200 feet deep. Wells drilled in Tertiary sandstones to a depth of 50 to 500 feet may supply 1 to 50 gpm. Wells in unconsolidated glacial and alluvial deposits yield the largest supplies of groundwater in the Rocky Mountain National Park. These deposits commonly can supply 5 to 100 gpm to wells. (Knapp-USGS)
W71-09597

HYDRAULIC TESTING OF THE OJO ALAMO SANDSTONE IN HOLE GB-3, PROJECT GASBUGGY, RIO ARRIBA COUNTY, NEW MEXICO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-09599

WATER RESOURCES OF THE SLAGLE-SIMPSON-FLATWOODS AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02F.
W71-09657

WATER WITCHING U.S.A.,
E. Z. Vogt, and R. Hyman.
Chicago, University of Chicago Press, 1959, 248 p.

Descriptors: *Dowsing, *Water wells, Groundwater, Exploration.
Identifiers: Water witching, Water well location, Magical divination.

For centuries a common figure on the rural horizon has been the man with the charmed forked stick - the water witch, upon whose supposed super natural powers the hopes of many a country farmer have depended. A quaint supersition, some say, but it is a superstition that has persisted and is still widely practiced, despite the advances of science and technology. The authors of this book address themselves to this magical, non-scientific practice that has continued in an age of surmised rationality. Drawing on the authors' extensive backgrounds in anthropology, social psychology, and professional magic, they have studied water witching and water diviners as objectively and sympathetically as possible. They recognize the important role that magic plays in all societies, and they also recognize the very real problems of water shortage that underlie the continued dependence on the divining rod in many parts of the United States, despite the fact that there is no scientific evidence that water witching works. This is a necessity for all groundwater supply workers. (Campbell-NWWA)
W71-09722

CAN GROUNDWATER POLLUTION BE AVOIDED,
Missouri Geological Survey, Rolla.

For primary bibliographic entry see Field 05B.
W71-09729

COST OF WELLS AND PUMPS,
Illinois State Water Survey, Urbana.
William C. Ackermann.
Groundwater, Vol 7, No 1, p 35-37, January-February 1969, 6 fig.

Descriptors: *Water costs, *Groundwater, Water wells, Water rates.
Identifiers: *Well costs, *Pump costs, Sand and gravel wells, Shallow bedrock wells, Deep sandstone wells, Pumping rates.

The use of this material will give an estimate of the well and pump costs for projects requiring a given capacity. This is intended only as an instrument for establishing orders of magnitude as a basis for comparisons, and of course does not substitute for detailed engineering studies. Well cost data were analyzed for three categories according to the aquifer tapped: sand and gravel, shallow bedrock, and deep sandstone. In the sand and gravel category, tubular and gravel packed wells finished in the glacial materials above bedrock were considered separately. (Campbell-NWWA)
W71-09730

COST OF PUMPING WATER,
Illinois State Water Survey, Urbana.
William C. Ackermann.
Groundwater, Vol 7, No 1, p 38-39, January-February 1969.

Descriptors: *Water costs, *Groundwater, Water wells, Water distribution (Applied), Water rates, Pumps.
Identifiers: *Pumping costs (Wells), Power requirements.

Use of this material will assist in the determination of cost of pumping water, given the quantity of flow required, the total pumping head, the wire-to-water efficiency, and the unit cost of power. A table of conversions is presented to aid in reducing theoretical equations to simplified equations, and a figure is provided for graphical solutions of the equations. (Campbell-NWWA)
W71-09731

LOW RESISTIVITY ON ELECTRIC LOG COULD MEAN 'CHERT',
Schlumberger Well Surveying Corp., Tulsa, Okla.
A. H. Heim, and H. W. True.
World Oil, Vol. 142, No. 4, p. 126, 129-130, March 1956, 7 fig.

Descriptors: *Logging (recording), *Aquifer characteristics, Electric logging, Chert, Ground water, Oil industry.
Identifiers: *Electric log interpretation, Rock drillability.

Low resistivities frequently shown on electrical logs in 'Mississippi chert' sections have been attributed to a combined result of: (1) high porosities, (2) high formation water salinities, (3) possible interbedded shales. Cores from the Mississippian chert zones of some Oklahoma and Kansas wells were analyzed to find the causes for low resistivities frequently shown by such formations on electrical survey logs. All cores were a heterogeneous mixture of microcrystalline quartz material and siliceous shale. The quartzitic material (chert) varied from a dense, flint-like form to a chalky and porous form; porosities up to 40 percent were no uncommon and formation factors were as low as 5. Cores contained no conductive minerals PER SE. (Campbell-NWWA)
W71-09906

CYCLIC PUMPING FOR DRAINAGE PURPOSES,
California Univ., Davis.
G. Aron, V. H. Scott, and M. A. Abu-Zied.
Ground Water, Vol. 5, No. 1, p 35-38, January 1967, 2 tab., 2 fig., 3 ref.

Descriptors: *Water wells, *Pumps, *Aquifer characteristics, Ground water.
Identifiers: *Hydraulics of cyclic pumping, Cyclic pumping design.

Criteria and formulas are presented for scheduling cyclic pumping operations, to maintain a given minimum drawdown as required for drainage purposes. Keeping the total cycle length constant, the pumping periods are successively shortened and the shutoff periods lengthened. Solutions of the equation for the relative length of the shutoff periods are presented in a family of curves, which greatly simplifies the scheduling procedure. (Campbell-NWWA)
W71-09907

THE GROUND WATER CONSULTANT LOOKS TO THE DRILLER,
Guyton (William F) and Associates, Austin, Tex.
For primary bibliographic entry see Field 08A.
W71-09908

APPLICATION AND LIMITATION OF METHODS USED TO ANALYZE PUMPING TEST DATA,
Illinois State Water Survey, Urbana.
William C. Walton.
Water Well Journal, Vol 15, Nos. 2 and 3, Part 1, p. 22, 49, 50, 53, 56; Part 2, p. 20, 46, 48, 50, 52, February and March 1960, 2 tab., 5 fig., 13 ref.

Descriptors: *Water wells, *Aquifer characteristics, *Ground water, Theis formula, Jacob and Cooper formula, Boulton formula, Specific capacity, Transmissibility.
Identifiers: *Pump tests (wells), Hydraulic properties.

The nonequilibrium formula is widely used with pumping test data for determining the hydraulic properties of an aquifer. The most popular method for solving that formula is the straight-line method because of its simplicity of application and interpretation. However, the straight-line method is not applicable in some cases and it supplements, rather than supersedes, the more complicated type-curve method. Geologists and engineers have become familiar with the interpretation of time-drawdown graphs. Distance-drawdown graphs (radial profiles of cones of depression) have, on the other hand, received little publicity and they are not used as much as they ought to be to determine the hydraulic properties of aquifers and to confirm the existence of geohydrologic boundaries. Under complex aquifer conditions, early time-drawdown data can be misleading because of the inability of some aquifers to respond to pumping instantaneously as would a homogeneous, isotropic, and perfectly elastic artesian aquifer. Distance-drawdown data can be used to great advantage in the interpretation of early time-drawdown data. Under water-table conditions, the nonequilibrium formula does not describe completely the drawdown in wells during short periods of pumping. The gravity drainage of water through stratified sediments is not immediate and the unsteady flow of water towards a well in an unconfined aquifer is characterized by slow drainage of interstices. Thus, the coefficient of storage is not constant as assumed in the derivation of the nonequilibrium formula but varies and increases at a diminishing rate with the time of pumping. However, data collected towards the end of a pumping test, one or more days in duration, can in many cases by used to determine the hydraulic properties of an aquifer under water-table conditions. (Campbell-NWWA)
W71-09911

MODERN DESIGN TECHNIQUES FOR EFFICIENT HIGH CAPACITY IRRIGATION WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 08A.
W71-09913

MASTER THE TOOLS THAT COMBAT CORROSION,
Corrosion Mitigation Inc., Marietta, Ga.
For primary bibliographic entry see Field 08G.
W71-09915

APPLICATIONS OF ACETIC ACID TO WELL COMPLETION, STIMULATION AND RECONDITIONING,
Halliburton Co., Duncan, Okla.
For primary bibliographic entry see Field 08A.
W71-09917

WELL DATA GLOSSARY,
American Petroleum Inst., Dallas, Texas.

A.P.I. Bulletin D-12, First Edition, April 1966. 115 p.

Descriptors: *Information retrieval, *Oil industry, Data Collections, Drilling, Wells.
Identifiers: *Well data terms, Standardization of terms, Data Abbreviations.

This Well Data Glossary is intended to present a list of suggested standards for well data terms that are in common use by the oil industry, particular in intercompany data systems, such as the Permian Basin Well Data System and the Rocky Mountain Well History Control System. With the oil industry involved in converting data to a machine retrievable form from literally hundreds of thousands of wells, the advantages of standardization bceome clear when the cost of making the Permian Basin the Rocky Mountain and a company well data system machine compatible is reckoned. When changes are made in an external data system , costs are again increased by the necessary reprogramming of that system and the resulting change in the company system. The more standards that each system accepts, the more time and money that is saved by the companies individually and collectively. The Glossary is designed for many users. Standard terms and abbreviations are for the data collectors, scouts, and commercial data companies. The codes, abbreviations and data fields are for those working with data conversion and retrieval problems. One of the primary uses for the Glossary is to define the data elements - those items requiring data fields. (Campbell-NWWA)
W71-09919

4C. Effects on Water of Man's Non-Water Activities

NATIONAL CONFERENCE ON URBAN WATER RESEARCH, KEYNOTE AND PLENARY SESSION PAPERS.
Office of Water Resources Research, Washington D.C.
For primary bibliographic entry see Field 06B.
W71-09468

A NATIONAL URBAN WATER RESOURCES RESEARCH PROGRAM.
Office of Water Resources Research, Washington D.C.
For primary bibliographic entry see Field 06B.
W71-09469

EROSION AND SEDIMENTATION FOLLOWING ROAD CONSTRUCTION AND TIMBER HARVEST ON UNSTABLE SOILS IN THREE SMALL WESTERN OREGON WATERSHEDS,
Forest Service, Portland, Oreg. Pacific Northwest Forest and Range Experiment Station.
R. L. Fredricksen.
Forest Service Research Paper PNW-104, 1970. 15 p, 5 fig, 4 tab, 15 ref.

Descriptors: *Landslides, *Sediment yield, *Clear-cutting, *Roads, *Oregon, Forest management, Sedimentation, Soil erosion, Erosion, Road construction, Watershed management, Cutting management, Lumbering.
Identifiers: Patch-cutting, *Logging roads.

In two steep headwater drainages in Oregon landslides were the predominant source of increased sedimentation of streams following timber harvest. Patch-cut logging with forest roads increased sedimentation relative to a control by more than 100 times over a 9-year period. Landslide erosion was greatest where roads crossed high gradient stream channels. In an adjacent clearcut watershed with no roads, sedimentation increased three times that of the control. (Knapp-USGS)
W71-09655

RUNOFF OF DEICING SALT: EFFECT ON IRONDEQUOIT BAY, ROCHESTER, NEW YORK,
Rochester Univ., New York. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05B.
W71-09803

4D. Watershed Protection

WATER WATER,
Department of Environmental Protection, Trenton, N. J. Bureau of Fisheries Management.
Hill Zich.
Article in two parts. New Jersey Outdoors, Vol 21, No 4 and 5, p 2-9, p 7-13, Jan and Feb 1971. 13 figures.

Descriptors: *Water resources development, Water pollution control, Administration, Recreation demand, Social participation.
Identifiers: *Division of Fish, Game and Shell Fisheries, State Department of Health, National Committee on Natural Resources.

The present and future situation in regard to the world's water resources is described stressing the importance of public initiative in planning the future. The major causes of water pollution are pointed out. Implementation of the existing laws provides the most direct means of curing these pollution problems. (Holmes-Rutgers)
W71-09484

CONSEQUENCES OF HISTORIC RAINFALL ON WESTERN IOWA FARMLAND,
Agricultural Research Service, Columbia, Mo. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 02J.
W71-09609

SEDIMENT: EVERYBODY'S POLLUTION PROBLEM,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-09760

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

RADIATION SURVEILLANCE NETWORK.
Division of Operational Safety (AEC), Washington, D.C.

WASH-1148, Nov 1969. 140 p, fig, tab.

Descriptors: *Environment, *Monitoring, *Air pollution, *Water pollution, Water pollution sources, *Water pollution control, Population, Data collections, Data processing, Data transmission.

The purpose is to bring into one reference document a description of the major radiation surveillance and monitoring programs conducted by organizations within the United States, Canada, and Mexico. These programs described here were selected on the basis that they provide published data which is routinely available to the scientific community and the public. (Houser-NSIC)
W71-09489

ENVIRONMENTAL MONITORING REPORT JULY-DECEMBER 1969 and 1969 SUMMARY,
Mound Lab., Miamisburg, Ohio.
H. F. Anderson, and W. E. Sheehan.
Availability: NTIS. MLM-1616, Dec 1969. 50 p, 3 fig, 11 tab.

Descriptors: *Environment, *Air pollution, *Water pollution, Water pollution sources, *Water pollution control, Radioisotopes, Radioactive waste disposal, Rivers, Regulation, Standards.

The concentration of radioactive materials detected in the environment surrounding Mound Laboratory, Miamisburg, Ohio, is presented for the second half of 1969, and a summary is presented for the entire year. The average concentration of radionuclides from Mound Laboratory in the Great Miami River and in the environmental air was within the stringent standards of safety specified by the Atomic Energy Commission. (Houser-NSIC)
W71-09490

A RAPID-FIELD SAMPLING SYSTEM FOR TRITIUM IN ATMOSPHERIC HYDROGEN,
Miami Univ., Fla.
H. G. Ostlund.
Availability: NTIS. TID-25345, Feb 1, 1970. 6 p.

Descriptors: *Tritium, *Measurement, *Instrumentation, *Sampling, *Air pollution, *Pollutants, Hydrogen, Oxygen, Water, Design criteria, Specifications.

A prototype field sampling system is presented for tritium in atmospheric hydrogen. Within a few weeks it will begin to undergo test, and final specifications will be determined. The machine will collect simultaneously one sample of atmospheric HTO, and one of HT, for each sampling period of 5 to 15 minutes. It is designed for use in an automobile or in an aircraft with pressurized cabin. During the remaining part of the first contract year, we will take the field unit in a car, station wagon or small van, and drive through a cold front collecting samples of atmospheric HTO and HT from both air masses. (Houser-NSIC)
W71-09491

RADIOACTIVE FALLOUT IN AIR AND RAIN--RESULTS TO THE MIDDLE OF 1969,
Atomic Energy Research Establishment, Harwell (England).
R. S. Cambray, E. M. Fisher, W. L. Brooks, and D. H. Pierson.
Availability: NTIS. AERE-R-6212, Nov 1969. 52 p.

Descriptors: *Sampling, *Atmosphere, *Air pollution, *Fallout, Measurement, Analytical techniques, Radioisotopes, Precipitation (Atmospheric), Tritium, Cesium, Strontium radioisotopes, Deposition (Sediment).

Sampling of dust and rainwater from the United Kingdom and elsewhere is reported. Results are presented of analyses of these samples for various fission products and certain other radionuclides. (Houser-NSIC)
W71-09492

RADIATION DOSIMETRY, CORRELATION, AND DATING OF CALCAREOUS DEEP-SEA CORES,
Dartmouth Coll., Hanover, N.H.
N. M. Johnson.
Availability: NTIS. NYO-3860-2, Feb 15, 1969. 103 p.

Descriptors: *Cores, *Age, *Geologic formations, *Oceans, *Sedimentary basins (Geological), *Radioactive dating, Mineralogy, Trace elements, Hydrologic data.

The method of obtaining geologic age relationships from the radiation dosimetry of natural thermoluminescence has been evaluated for deep-sea sediments. Dosimetry values and alpha activities were measured at intervals along five cores of foraminiferal lutite which collectively represent a complete stratigraphic section of the pleistocene. The mineralogy and concentrations of some trace elements in the cores were also determined and their effect on the natural thermoluminescence analyzed. (Houser-NSIC)
W71-09494

A QUICK METHOD FOR THE RADIOCHEMICAL DETERMINATION OF CESIUM-137 IN WATER (IN GERMAN),
Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).
W. Rehak, and G. Ubl.
Availability: USAEC Depository Libraries in the U.S. and overseas. SZS-1/70, Jan 1970. 7 p, 2 fig, 6 ref.

Descriptors: *Cesium, *Radiochemical analysis, *Water, *Ion exchange, *Absorption, Measurement, Radiation.
Identifiers: Beta activity.

The radiochemical determination of CS-137 in water samples free of suspended matter is performed by an ion exchange procedure with ammonium molybdophosphate (AMP) and measuring the beta activity of the ion exchanger. A simple procedure for the preparation of AMP with good exchanging properties is described. (Houser-NSIC)
W71-09511

MEASUREMENTS OF BOMB-PRODUCED RADIOCARBON IN THE SURFACE AND SUB-SURFACE WATERS OF THE PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
H. E. Suess.
Availability: NTIS. UCSD-34-P-163-X-1, March 1, 1970. 17 p.

Descriptors: *Monitoring, *Carbon, *Activated carbon, *Pacific ocean, Sampling, Analytical techniques.
Identifiers: Concentration, Counter.

Progress is reported during the year 1970 of the La Jolla program for monitoring the Carbon-14 content of surface seawater in the Pacific Ocean. Additional plans of sampling and the moving of the laboratory are also reported. (Houser-NSIC)
W71-09513

PHOSPHATE MEASUREMENTS IN NATURAL WATERS, A CRITIQUE,
Minnesota Univ., Minneapolis. Limnological Research Center.
William Chamberlain, and Joseph Shapiro.
Available from the National Technical Information Service as PB-200 824, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Contribution No 103, 1971, 20 p, 1 tab, 37 ref. OWRR Project B-099-Minn (4).

Descriptors: *Phosphates, *Lakes, Ecosystems, Minnesota, Hydrolysis, Ion-Exchange, Tracer, Bioassay, Arsenate, Seston, Analytical techniques, *Pollutant identification, Water pollution effects.
Identifiers: *Molybdenum blue method, Acid labile inorganic phosphate, Hidden blank error, Spectrophotometer, Dissolved phosphate.

The so-called molybdenum blue method for assaying the inorganic phosphate concentration of solutions is well established in scientific circles. Numerous modifications of the method have appeared and the method is the basis of almost all routinely

employed techniques for assaying phosphate in natural waters. This study was concerned with what, specifically, is being measured by the molybdenum blue method and whether or not the method is providing valid estimates of the dissolved inorganic phosphate concentration of natural waters. It is concluded that neither a hidden blank error or the hydrolysis of organic phosphate esters will seriously bias the results obtained by the molybdenum blue method. Except in instances where arsenate is a problem, the molybdenum-reactive material present in natural waters may be regarded as inorganic phosphate, although not necessarily as free phosphate ion. Any attempt to differentiate or define phosphorus availability without considering the time element is futile. If investigators continue to measure concentrations of dissolved inorganic phosphorus and refer to them as such that they be aware of certain problems and attempt to circumvent them. The adoption of a technique for surface waters is urged such as a 6-second procedure where arsenic is definitely shown to be absent, or a short period (e.g. 10 seconds) extraction technique where arsenic is, or may be, present, either method to be done on 0.5 micron filtered water. Only in this way will 'soluble reactive phosphorus' and 'dissolved inorganic phosphorus' begin to approach each other and only then, perhaps, will phosphate concentration estimates become meaningful. (See also W71-09564)
W71-09557

MECHANICAL SAMPLER FOR DETERMINING THE WATER QUALITY OF EPHEMERAL STREAMS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
S. Knedlhans.
Water Resources Research, Vol 7, No 3, p 728-730, Jun 1971. 3 p, 3 fig, 1 ref.

Descriptors: *Sampling, *Equipment, *Ephemeral streams, Monitoring, Water quality, Pollutant identification.
Identifiers: *Automatic samplers.

A simple mechanical system for automatically sampling small ephemeral streams is described. A rack fitted with two columns of bottles and a float assembly permits sampling of both rising and falling stages at predetermined water depths. (Knapp-USGS)
W71-09613

STATISTICAL LIMITS OF ACCURACY AND PRECISION OF GROSS ALPHA AND BETA RADIOACTIVITY MEASUREMENTS IN WATER,
Northeastern Radiological Health Lab., Winchester, Mass.
Edmond J. Baratta, and Forrest E. Knowles, Jr.
Radiological Health Data and Reports, Vol 12, No 4, p 195-198, April 1971. 4 p, 6 tab, 4 ref.

Descriptors: *Monitoring, *Radioactivity, *Pollutant identification, *Public health, *Statistics, Background radiation, Water analysis, Radiochemical analysis, Water quality, Sampling.
Identifiers: Alpha and beta radioactivity analysis (Water).

This paper presents the results of a technical experiment designed to determine the effectiveness of measurements for gross alpha and beta radioactivity in water. Since this analysis is normally used as a 'screening' technique, it is essential that the limits of precision and accuracy of the method be known. Gross measurements are still being used in preoperational reactor surveys as an indication of the 'background' levels and to monitor radioactivity when the reactor becomes operational. In addition, the Public Health Service standard for drinking water has, in lieu of a determination of radium-226 and strontium-90, limits for gross alpha and beta radioactivity, respectively. The precision and accuracy of a standard method for analysis of gross alpha and beta radioactivity in water were determined through the cooperation of private and government laboratories. It was found that gross alpha radioactivity could be determined with an overall precision of 12%, while the gross beta radioactivity could be determined with a precision of 7%. The accuracy of the gross alpha activity measurements was within 10%, and for the gross bet activity measurements, 1%. (Knapp-USGS)
W71-09626

ESTABLISHMENT OF AN AUTOMATIC WATER QUALITY SURVEILLANCE PROGRAM,
Corps of Engineers, Mobile, Ala. Environmental Quality Section.
For primary bibliographic entry see Field 05G.
W71-09634

ECHINODERMS: AN AUTORADIOGRAPHIC STUDY OF ASSIMILATION OF DISSOLVED ORGANIC MOLECULES,
Newcastle-uon-Tyne Univ. (England). Dept. of Zoology; and Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.
For primary bibliographic entry see Field 05C.
W71-09662

ON THE SIGNIFICANCE OF METAL COMPLEXING AGENTS IN SECONDARY SEWAGE EFFLUENTS,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
For primary bibliographic entry see Field 05B.
W71-09674

SHORT-TERM FLUORESCENCE AND DISSOLVED OXYGEN RELATIONSHIPS IN THE UPPER CHESAPEAKE BAY,
Maryland Univ., Solomons. Natural Resources Inst.
David A. Flemer, and Robert B. Biggs.
Chesapeake Science, Vol 12, No 1, p 45-47, March 1971. 2 fig, 7 ref.

Descriptors: *Dissolved oxygen, *On-site data collections, *Phytoplankton, *Fluorescence, *Sampling, On-site investigations, Hydrologic data, Pigments, Chlorophyll, Data collections, Heterogeneity.
Identifiers: *Chesapeake Bay, Chlorophyll a.

Short-term variations in fluorescence (chlorophyll a) and dissolved oxygen were recorded from a fixed station between 6 and 7 m over 12 m of water in upper Chesapeake Bay. The late afternoon curves showed a positive relationship and the early evening curves exhibited an inverse correspondence. The observed oscillations could result from internal waves but the variations in space and time may represent discrete patches of phytoplankton that move past the fixed sampling point. These results have important ecological consequences and may, or should, affect future sampling regimes of the estuary. (LeGore-Washington)
W71-09681

ROLE OF EXCRETED CHLORTETRACYCLINE IN MODIFYING THE DECOMPOSITION PROCESS IN FEEDLOT WASTE,
Colorado State Univ., Ft. Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 05C.
W71-09749

RAPID CONCENTRATION OF STRONGYLE EGGS FROM EQUINE FECES FOR IN VITRO STUDIES,
Louisiana State Univ., Baton Rouge. Dept. of Veterinary Science.
Thomas R. Bello, and Virginia L. Gordon.
American Journal of Veterinary Research, Vol 31, No 12, p 2285-2288, December, 1970, 1 tab, 7 ref.

Descriptors: *Farm wastes, Laboratory tests, Nematodes, Eggs, *Separation techniques, Pollutant identification.
Identifiers: Equine, Horse, Laboratory procedures, *Strongyle eggs.

For in vitro studies, large numbers of strongyle eggs in equine feces were suspended, sieved, sedimented in water, and then floated in sucrose solution by centrifugation. The eggs were prepared for cultures by disinfecting with 1.2 to 1.3% sodium hypocholorite solution and washing in sterile Tyrode's solution containing antibiotics. This rapid concentration technique was 100.2 .. 2.2% efficacious based on eggs-per-gram (e.p.g.) fecal counts from 20 horses. (Christenbury-Iowa State)
W71-09750

POLLUTION, PESTICIDES AND THE PEOPLE -- AGRICULTURE AND OUR NATURAL ENVIRONMENT.
Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept.
For primary bibliographic entry see Field 05C.
W71-09752

WHAT DO WE MEAN BY POLLUTION,
Iowa State Univ., Ames. Dept. of Economics.
Charles Gratto.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 1-6.

Descriptors: *Environment, *Water quality, Water pollution effects, Standards, Waste disposal, Ecosystems, Costs, Taxes, Prices.
Identifiers: *Socioeconomic characteristics, Fines and penalties, Adversary situation, Inducements.

Environmental quality is measured by some standard, such as content, and by performance. We can measure environmental quality by comparing an existing content with a desired content. Likewise, we can evaluate environmental quality by comparing an existing level of performance with a desired level of performance. One important performance characteristic of environment is balance over time. The content and performance standards we apply to the environment let us determine if this dynamic balance is being maintained. Problems of environmental quality would be easier to solve if we knew the tolerable levels of concentration for all kinds of matter and energy that a relevant to managing the environment. Public policies for reaching a desired level of quality include learning, fines and penalties, the adversary situation, inducements and cooperation, taxation, and the price system. (See also W71-09752) (White-Iowa State)
W71-09753

DETERMINATION OF MERCURY BY USING A GOLD TRAP IN SAMPLES CONTAINING CONSIDERABLE SULFIDE MINERALS,
Geological Survey of West Malaysia, Ipoh.
P. C. Leong, and H. P. Ong.
Analytical Chemistry, Vol. 43, No. 7, June, 1971, p. 940-941, 1 fig., 2 tab.

Descriptors: Equipment, Absorption, *Pollutant identification, Analytical techniques.
Identifiers: *Mercury, Reagents, Dithizone, Gold trap, Sulfide minerals.

This article offers a suitable method for determining microamounts of mercury in soil and rock samples which may contain considerable amounts of sulfide minerals. The equipment consists of a borosilicate test tube 19 mm o.d. x 150 mm joined to an L-shaped borosilicate glass tubing of 9 mm (o.d). The horizontal part of the tubing holds a column of cut up gold foil. The other end of the tubing is dipped into an absorbing mixture consisting of 0.2 M potassium permanganate solution diluted with an equal volume of 10 percent sulfuric acid. Dithizone, 0.0015 percent, was prepared fresh daily by diluting 15 ml of 0.01 percent solution to 100 ml with chloroform. A test tube con-

aining the absorption mixture was placed in a flask which was in turn connected to a suction pump. The sample is heated and suction pressure is applied. The absorption mixture is decolorized with a slight excess of sulfurous acid, and 1 ml of dithizone solution is added. Mercury content is determined by comparing the color of the organic layer in the organic layer in the absorbing mixture with the set of standards. Results from tests using synthetic samples indicate that the method gives reasonably good results and should be useful to laboratories having no sophisticated instruments. (Upadhyaya-Vanderbilt)
W71-09771

THE COMPLEX CHEMISTRY OF METHYLMERCURY CATIONS (IN GERMAN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. of Inorganic Chemistry.
G. Schwarzenbach, and M. Schellenberg.
Helvetics Chemica Acta, Vol. 48, Fascicutus 1 (1965), No. 3, p. 28-48, 3 fig., 19 ref.

Descriptors: *Heavy metals, *Chemical reactions, Metals, Analytical techniques, Organic compounds, Carbohydrates, Path of pollutants, Biochemistry, Chemical properties, Water pollution sources, Pollutant identification.
Identifiers: *Mercury, Mercury pollution, *Methylmercury.

The stability constants of the methylmercury complexes CH3HgL1 - lambda with a considerable number of ligands L lambda - have been determined (Table 1). Like H-, the cation CH3Hg.. reveals the coordination number 1 almost exclusively. Some ligands form also binuclear adducts (CH3Hg)2L 2-lambda and sulfide even forms (CH3Hg)3S-. The coordination behaviours of CH3Hg.. and H.. however are very different concerning the selection of ligands, the former being a soft and the latter a hard acid in the sense of PEARSON. The entropy, delta S, of the reaction: H (..) ..L- yield HL is more positive by about 14 e.u. than delta S of the reaction: CH3Hg (..) ..L- yield CH3HgL. The hydrogen ion in aqueous solution has a far greater order producing action on the solvent than CH3Hg... Two dyes also have been investigated, which may serve as indicators for CH3Hg.. and for the determination of pCH3Hg (—log (CH3Hg-)). (Novotny-Vanderbilt)
W71-09772

MERCURY IN THE AIR.
Committee for Environmental Information.
For primary bibliographic entry see Field 05B.
W71-09775

A COMPREHENSIVE STUDY OF SAN FRANCISCO BAY,
California. University of Berkeley. Sanitary Engineering Research Lab.
E. A. Pearson, P. N. Storrs, and R. E. Selleck.
California State Water Resources Control Board Publication 42, 1971, p. 85, 8 fig, 17 tab, 24 ref. SERL Report No. 67-5.

Descriptors: *Bays, *Physical properties, *Chemical analysis, *Sampling, *Waste disposal, *Tidal effects, *Sedimentation, *Biology, *Fisheries, Water quality, Analytical techniques, Monitoring.
Identifiers: *San Francisco Bay, Interrelationships.

The State Water Quality Control Board conducted a comprehensive study of San Francisco Bay. The investigation was to determine existing water and sediment quality for quantitative inventory of waste discharges in the Bay, and to determine the effect or influence of significant waste discharges on the aquatic environment of the Bay. Included in the investigation were: physical, chemical and microbiological sampling and analytical methods; biological sampling and analytical methods; waste discharges and loadings; physical and hydrological characteristics; physical, chemical and biological water and sediment data; water and sediment quality and waste discharge relationships and a model of mixing and diffusion. This report summarizes the entire investigation with conclusions and recommendations. (Ensign-PAI)
W71-09790

EFFECTS OF PULP MILL EFFLUENT ON WATER QUALITY AND BIOTA TRACE ELEMENT CHARACTERISTICS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 05C.
W71-09793

A CONSTANT GEOMETRY APPROACH TO in situ SEABED GAMMA MONITORING,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
E. Reynolds.
Health Physics, Vol. 20, No. 3, p 241-251, March 1971, 11 fig, 2 tab, 14 ref.

Descriptors: *Monitoring, *Waste disposal, *Radioactive waste disposal, Methodology, Technology, Application equipment, Design criteria.
Identifiers: *Irish Sea, *In-situ monitoring, *Constant Geometry approach, Seabed gamma probe.

An in situ seabed gamma monitoring device is described and its application theory explained. Essential design requirements of any in situ seabed gamma monitor include constant detector-to-sample geometry, adequate sensitivity and reliable performance, portability, and spectrometric facilities. Experimental results obtained in the Irish Sea are compared with results from seabed samples analysed in the laboratory. The efficacy of the method for the rapid assessment of the intensity of the seabed gamma field arising from radioactive waste disposal is indicated by the correlation between the two sets of data. (Ensign-PAI)
W71-09798

PARTICULATE Pb, Pb 210 AND Po 210 IN THE ENVIRONMENT,
Batelle Memorial, Richland, Wash. Pacific Northwest Labs.
J. C. Langford.
Health Physics, Vol. 20, No. 3, p 331-336, March 1971, 3 tab, 34 ref.

Descriptors: *Pacific Ocean, *Atlantic Ocean, *Lead radioisotopes, *Measurement, *Fallout, Water pollution sources, Pollutant identification.
Identifiers: *Polonium-210, *Particulate matter, Industrial wastes, Engine emissions.

Particulate Pb, 210Pb and 210Po were measured in the Pacific Ocean west of Newport, Oregon and in Atlantic Ocean between the Bahama Islands and Sierra Leone, Africa. In the Pacific Ocean specific activity of 210Pb increased with depth due to the decreasing concentrations of stable Pb with depth. In the Atlantic Ocean the average particulate 210Po concentration was 20% higher than the average 210Pb concentration yet both isotopes were about one-tenth their radio-equilibrium concentrations from 226Ra. The particulate stable Pb concentration in the Atlantic Ocean decreased ninefold. Pb concentrations are thought to be from vehicular and industrial sources transported to the marine environs by atmospheric processes. (Ensign-PAI)
W71-09799

NATIONAL MONITORING PROGRAM FOR THE ASSESSMENT OF PESTICIDE RESIDUES IN WATER,
Geological Survey, Arlington, Va; and Environmental Protection Agency, Washington, D.C.; and Water Quality Office, Athens, Ga.
H. R. Feltz, William T. Sayers, and H. P. Nicholson.
Pesticides Monitoring Journal, Vol 5, No 1, p 54-62, June 1971. 9 p, 1 fig, 1 tab, 23 ref.

Descriptors: *Monitoring, *Pesticide residues, *Sampling, Water supply, Surface waters, Groundwater, Rainfall, Surveys, Analytical techniques, Water analysis, Pollutant identification, Water pollution sources.
Identifiers: *Pesticide monitoring.

The proposed design of the program for monitoring pesticide residues in the hydrologic environment is a revision of the program initiated in 1967 by the Federal Water Pollution Control Administration and the U.S. Geological Survey and provides for a continuing assessment of the general levels of pesticides in the water and bottom sediments of the Nation's water courses. Water samples collected quarterly and bed material samples collected semiannually at 161 sites in the conterminous United States, Alaska, Hawaii, and Puerto Rico will be examined for the presence of pesticide residues. Sampling sites were chosen at random from hydrologic units within the major drainage basins defined by the Water Resources Council. Analyses will be performed using separation and identification techniques currently acceptable to the scientific community, and the data evaluation will be published in the Pesticides Monitoring Journal. (Knapp-USGS)
W71-09802

DETERMINATION OF TRACE QUANTITIES OF NITRILOTRIACETIC ACID BY DIFFERENTIAL CATHODE-RAY POLAROGRAPHY,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
Badar K. Afghan, and Peter D. Goulden.
Environmental Science and Technology, Vol 5, No 7, p 601-606, July 1971. 6 p, 8 fig, 4 tab, 12 ref.

Descriptors: *Polarographic analysis, *Pollutant identification, *Detergents, *Chemical analysis, Chelation, Surfactants, Nitrogen compounds, Organic compounds.
Identifiers: *Nitrilotriacetic acid, NTA.

Two methods for the determination of nitrilotriacetic acid in natural water and detergents are proposed, depending upon the nature of the sample. Determination of 'free' NTA in natural water is based on the formation of a lead-NTA complex in alkaline medium at pH 8.0 using differential cathode-ray polarography. Determination of 'total' NTA is based on releasing NTA from metal complexes under acid conditions. The subsequent addition of EDTA and return of the sample to pH 8, preferentially bind the metals with EDTA. This frees NTA from metal complexes and the released NTA is then determined by lead-NTA method. The procedure for determination of NTA content in detergents utilizes bismuth-NTA reduction wave at pH 2.0. The method is capable of detecting as little NTA as 10 micrograms/liter without any preconcentration of the sample. (Knapp-USGS)
W71-09805

RADIOECOLOGICAL INVESTIGATION IN THE REGION OF MURUROA ATOLL (TUAMOTU ISLAND),
Institute of the Biology of the Southern Seas, Sevastopol (USSR).
A. N. Kolesnikova, G. V. Barinov, and A. Ya. Zesenko.
Available from NTIS. Report AEC-tr-7024, p 180-185 (Radiobiologiya, Vol. 9, No. 1, p 139-143 (1969)). 3 fig, 3 tab, 4 ref.

Descriptors: *Radioactivity effects, *Crayfish, *Radioisotopes, *Plankton, Fallout, Pacific Ocean, Oceanography, Atolls, Gamma rays, Spectroscopy, Instrumentation.

Data are presented from the 20th voyage of the oceanographic ship Mikhail Lomonosov through former and present day atomic firing ranges. The gamma spectra of sample of zooplankton showed the presence of cerium-141 and -144, zirconium-95, niobium-95, and ruthenium-103 in concentra-

tions from 0.16 to 12 pCi per kg of live weight. In the region of Mururoa Atoll, the French atomic firing range, anomalous crayfish were detected, the number of which was proportional to the radioactivity of the plankton. (Bopp-NSIC)
W71-09848

NATURAL AND ARTIFICIAL RADIONUCLIDES IN SEAFOODS AND MARINE PROTEIN CONCENTRATES,
Oregon State Univ., Convallis. Dept. of Oceanography.
Thomas M. Beasley, Charles L. Osterberg, and Yvonne M. Jones.
Nature, Vol 221, p 1207-9, 1969, 3 tab, 19 ref.

Descriptors: *Food chains, *Marine animals, *Radioisotopes, *Analytical technique, Instrumentation, Absorption, Lead radioisotopes, Cobalt radioisotopes, Radium radioisotopes, Human population.
Identifiers: Cesium radioisotopes, Manganese radioisotopes, Thorium radioisotopes, Polonium radioisotopes.

Radionuclide concentrations in seafoods were far below a hazardous level, but continued use of marine protein concentrates could result in the polonium-210, lead-210 pair becoming the principal source of the skeletal dose. Ra-226, Th-228, and the gamma-emitting radionuclides, Co-60, Mn-54, and Cs-137 were determined by gamma counting using multidimensional gamma spectrometry; Po-210 and Pb-210 by oxidation of organic matter in HClO4-HNO3 and deposition Po-210 on pure silver, and separation of Pb-210 from the plating matrix. (Bopp-NSIC)
W71-09849

RESEARCH ON THE MARINE FOOD CHAIN, PROGRESS REPORT, JULY 1969-JUNE 1970, PART III,
California Univ., San Diego-La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05C.
W71-09859

STUDY OF THE DISTRIBUTION OF RUTHENIUM IN AN ECOLOGICAL POND USING NEUTRON ACTIVATION ANALYSIS, (In French),
Centre d'Etude de l'Energie Nucleaire, Grenoble (France). Laboratoire de Biologie Vegetale.
For primary bibliographic entry see Field 05B.
W71-09864

5B. Sources of Pollution

IMPLICATIONS OF CROP-PRODUCTION TECHNOLOGY FOR ENVIRONMENTAL QUALITY,
Illinois Univ., Urbana. Dept. of Agronomy.
S. R. Aldrich, W. R. Oschwald, and J. B. Fehrenbacher.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 7-24, May 1971. 8 fig, 6 tab, ref.

Descriptors: *Agriculture, *Environment, *Farm wastes, *Crop production, Farm management.
Identifiers: *Crop-production technology, Environmental quality.

Illinois is used as a model to examine some effects of technology on the environment. The effects of selected modern crop production technologies are examined, including the use of nitrogen and phosphorus as fertilizers. Recent restrictions on the use of certain production technologies and attacks on fertilizer use have led to analysis in greater detail of the possibilities for an consequences of producing crops with less use of available technology. Return to more primitive agricultural methods, however, is regarded as unwise. The justification for using each practice and subsystem of production must be challenged to insure the least undesirable impact on the environment. The utilization of the best available crop-production technology will likely meet the needs of society with the least harm to the environment. (Wray-Chicago)
W71-09476

RADIATION SURVEILLANCE NETWORK.
Division of Operational Safety (AEC), Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-09489

SURVEY OF ENVIRONMENTAL RADIOACTIVITY FOR PERIOD JANUARY 1, 1969 TO JUNE 30, 1969,
Iowa State Univ. of Science and Technology, Ames.
M. D. Voss.
Availability: NTIS. Ames Laboratory, IS-2154, Aug 1969. 20 p.

Descriptors: *Environment, *Environmental effects, *Sampling, *Water, *Air, *Sedimentation, Water pollution, Nuclear reactors, Research equipment, Effluents, Fallout, Precipitation (Atmospheric).

The environmental program consists of air samples, soil, vegetation, river water, bottom sediment, precipitation, pond water, ALRR outfall, and well water samples. The ALRR reached full power as of 7/12/65. The data indicate that the ALRR has not contributed a significant amount of radioactivity to the environment in the Ames area. (Houser-NSIC)
W71-09496

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JANUARY-JUNE, 1968,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
T. H. Essig.
Availability: NTIS, US Department of Commerce, Springfield, Virginia, ($3.00 per copy; $0.95 microfiche). Battelle-Northwest BNWL-984, Jan 6, 1969. 20 p, 2 fig, 6 tab, 5 ref.

Descriptors: *Groundwater, *Groundwater movement, *Water pollution, *Water pollution control, *Water pollution effects, *Water pollution sources, Effluents, Soil water movement, Sediments, Radioactive well logging, Radioactivity effects.

More than 500 wells have been drilled to groundwater on the Hanford project for surveillance of radionuclide movement through sediments both above and below the regional water table. This report provides an evaluation of the status of groundwater contamination resulting from disposal of plant effluents. Total beta concentrations in the unconfined and confined groundwater aquifers are presented. Results are tabulated for well-water samples in which total beta concentrations exceeded the analytical limit. The average concentrations for the previous report period are listed for comparison. (Houser-NSIC)
W71-09497

BETA RADIOACTIVITY IN ENVIRONMENTAL AIR AND PRECIPITATION AT LOS ALAMOS, NEW MEXICO, FOR 1969,
Los Alamos Scientific Lab., N. Mex.
W. R. Kennedy, and J. W. Aeby.
Availability: NTIS. LA-4388, Jan 1970. 10 p, 3 fig.

Descriptors: *Environment, *Air pollution, *Precipitation (Atmospheric), Sampling, Water, Water pollution, Water pollution sources, Fallout, Nuclear explosions.
Identifiers: Beta activity, Concentration, Los Alamos, New Mexico nuclear detonations, Testing.

Beta activity of particulate matter in both air and precipitation for 1969 are reported for Los Alamos, New Mexico. The gradually increasing levels in both air and water samples from January through July reflect a contribution from foreign fallout arriving at our station as well as greater than average rainfall. The slight upward trend in October is a normal seasonal upswing. (Houser-NSIC)
W71-09498

SURVEY OF ENVIRONMENTAL RADIOACTIVITY,
Ames Lab., Iowa.
M. D. Voss.
Availability: NTIS. IS-2025, Jan 1969. 40 p.

Descriptors: *Environment, *Monitoring, *Pollutant identification, *Air pollution, *Water pollution, *Soil contamination, Water pollution sources, Surface waters, Rivers, Water holes, Ponds, Water wells, Sedimentation, Sampling, Analytical techniques, Nuclear reactors.
Identifiers: Gross alpha, Gross beta, Concentration, USAEC-Site, Ames laboratory, Research reactor.

The environmental radiation monitoring program of the American laboratory is described. The program consists of gross alpha and beta determinations of air, soil, vegetation, river water, Ames Laboratory Research Reactor (ALRR) outfall, bottom sediment, precipitation, well water, and pond samples. The data indicate that the ALRR has not contributed a significant amount of radioactivity to the environment in the Ames area. (Houser-NSIC)
W71-09499

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JULY-DECEMBER 1969,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
D. H. Benham.
Availability: NTIS. BNWL-1392, May 1970. 20 p, 3 fig, 5 tab, 5 ref.

Descriptors: *Groundwater, *Radioisotopes, *Tritium, *Ions, *Nitrates, Measurements, Evaluation, On-Site investigations, Water pollution, Soil contamination, Water pollution sources, Standards.
Identifiers: Ruthenium, Nitrate ions, Concentration, Hanford site.

Surveillance of the groundwater beneath the Hanford site is reported. The concentration of the ruthenium, tritium, and nitrate ions in the area groundwater is considered. These concentrations are evaluated in terms of their respective concentrations guides and to PHS drinking-water standard. (Houser-NSIC)
W71-09500

1966 ENVIRONMENTAL MONITORING RADIATION LEVELS AT BROOKHAVEN NATIONAL LABORATORY,
Brookhaven National Lab., Upton, N.Y.
A. P. Hull, and J. T. Gilmartin.
Availability: NTIS. BNL-50196, Sep 1969. 32 p, 20 fig, 32 tab, 29 ref.

Descriptors: *Monitoring, *On-site data collections, *Sampling, *Nuclear reactors, *Measurement, *Background radiation, *Operations, Effluents, Gases, Particle shape, Particle size, Research facilities, Liquid wastes, Water pollution, Rivers, Radioisotopes.
Identifiers: Graphite research reactor, Particulates, Peconic River, High flux beam research reactor.

Measurements of natural background radiation levels and of increments attributable to laboratory operations obtained on site and in the vicinity of Brookhaven National Laboratory during 1966 are summarized. These increments include contributions from the gaseous and particulate effluent from the stack serving the Brookhaven Graphite

Research Reactor and the High Flux Beam Research Reactor, from multicurie field gamma sources, and from the discharge of low-level liquid wastes from the Laboratory's sanitary waste treatment plant into the headwaters of the Peconic River. (Houser-NSIC)
W71-09502

RADIOACTIVE WASTE DISCHARGES TO THE ENVIRONMENT FROM NUCLEAR POWER FACILITIES,
Bureau of Radiological Health, Rockville, Md. Div. of Environmental Radiation.
Joe E. Logsdon, and Robert I. Chissler.
Availability: NTIS PB-190 717. Bureau of Radiological Health, BRH/DER-70-2, March 1970. 76 p, 4 fig, 10 tab, 9 App.

Descriptors: *Nuclear power plants, *Liquid wastes, *Gases, *Nuclear waste, *Effluent, *Environment, Waste dilution, Waste disposal, Waste identification, Regulation management, Permits, Treatment facilities.

Data pertaining to discharges of radioactive liquid and gaseous wastes from nine selected operating nuclear power facilities are presented and discussed. Experience to date with nuclear power plants has shown that careful waste management practices, engineered safeguards, and proper operating procedures generally result in radioactivity levels in waste effluents of a few percent or less of the AEC's licensed discharge limits. Technical Specifications for all facilities limit liquid discharges such that average annual concentrations of radioactivity in the condenser cooling discharge canal will be less than values listed. Facility operating reports, which are prepared to demonstrate that the facility operator is in compliance with specific requirements of the operating license, vary widely as to units used and types of information concerning discharges of radioactive wastes. In general, there is a paucity of information in these reports concerning specific radionuclides discharged. A number of comparisons have been made of power produced versus liquid or gaseous waste discharges. The most predominant trends shown in these comparisons are that boiling water reactors discharge relatively large quantities of gaseous waste and pressurized water reactors discharge relatively high quantities of tritium in liquid wastes. Information is available concerning the type of waste treatment facilities installed at each nuclear power station. (Houser-NSIC)
W71-09503

COLUMBIA RIVER STUDIES, ANNUAL PROGRESS REPORT, 1969-1970,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09504

COLUMBIA RIVER STUDIES 1969-1970, UPTAKE OF Fe-55 BY MUSSELS FROM THE WASHINGTON COAST, 1962-1969,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09505

COLUMBIA RIVER STUDIES 1969-1970, ZINC BIOLOGICAL HALF-LIFE FOR OYSTERS IN A NATURAL ENVIRONMENT,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09506

COLUMBIA RIVER STUDIES 1969-1970, MONITORING OF MUSSELS FROM WASHINGTON WATERS FOR ZINC-65,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09507

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF TEMPERATURE AND IONIZING RADIATION ON THE LARVAE OF THE PACIFIC OYSTER,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09508

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF SHOCK TEMPERATURE AND IONIZING RADIATION ON PHYTOPLANKTON,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05C.
W71-09509

EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1967.
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05C.
W71-09510

A QUICK METHOD FOR THE RADIOCHEMICAL DETERMINATION OF CESIUM-137 IN WATER (IN GERMAN),
Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).
For primary bibliographic entry see Field 05A.
W71-09511

RADIOLOGICAL STATUS OF THE GROUNDWATER BENEATH THE HANFORD PROJECT, JANUARY-JUNE 1969,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
D. H. Denham.
Availability: NTIS. BNWL-1233, Nov 1969. 20 p, 3 fig, 6 tab, 5 ref.

Descriptors: *Groundwater, *Radioisotopes, *Tritium, *Hydrogeology, *Ions, *Nitrates, Water, Wastes, Water pollution, Water pollution sources, Soil contamination, Water wells.

Groundwater surveillance data of beta, tritium, and nitrate ion concentrations in water around and beneath the Hanford plant were evaluated. (Houser-NSIC)
W71-09512

MEASUREMENTS OF BOMB-PRODUCED RADIOCARBON IN THE SURFACE AND SUBSURFACE WATERS OF THE PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 05A.
W71-09513

FINAL REPORT OF OFF-SITE SURVEILLANCE FOR PROJECT PALANQUIN.
Southwestern Radiological Health Lab., Las Vegas, Nev.

Availability: NTIS. PNE-910-F, May 1970. 128 p.

Descriptors: *Monitoring, *Nuclear explosions, *Testing, *Population, *Radioactivity, *Radioactivity effect, Environment, Sampling, Air pollution, Water pollution, Water pollution sources, Vegetation, Data collections, Public health, Hazards.
Identifiers: Concentration, Nevada test site, Off-site work, Surveillance program.

Off-site surveillance is reported in support of the Palanquin event conducted on April 14, 1965. Support consisted of tracking the effluent, monitoring radiation dosage to the off-site population, and collecting environmental samples (air, milk, water, and vegetation). Analyses of radiological data indicate that radioactive effluent arising from this event did not present any health hazard to the off-site population, based on presently accepted safety criteria established by the USAEC. (Houser-NSIC)
W71-09514

RADIOACTIVITY IN WATER: PROJECT MILROW,
Isotopes, Inc., Palo Alto, Calif.
E. H. Essington, P. R. Fenske, and W. E. Nork.
Availability: NTIS, NVO-1229-135, March 1970. 45 p.

Descriptors: *Survey, *Explosions, *Explosives, *Radioactivity, *Water, *Radioactivity effect, *Radioecology, Ecosystem, Oceans, Aquatic environment, Effluents, Alaska, Islands, Hydrologic aspects, Seismic studies, Seismic waves, Faults (Geology), Surface drainage.
Identifiers: Surveillance program, Nuclear detonations, Peaceful uses, Amchitka.

Discusses post-milrow event conditions at Amchitka relative to explosion-produced radioactivity in water. Explosion effects which are related to modification of the hydrologic system are: (1) Formation of a rubble chimney and collapse sink, (2) formation of water spouts on the island and in the ocean during the seismic phase, (3) creation of lineations in the ocean possibly related to fault and fracture systems during the seismic phase, (4) formation of a long open fracture about 300 meters from ground zero that acted as a drain for surface water. (Houser-NSIC)
W71-09515

ENVIRONMENTAL RADIOACTIVITY - ISPRA (ITALY),
European Atomic Energy Community, Ispra (Italy).
M. de Bortoli, and P. Gaglione.
Availability: NTIS. EUR-4412, Sep 10, 1969. 60 p.

Descriptors: *Environment, *Radioactivity, *Measurements, *Fallout, *Water pollution, Strontium, Cesium, Pollutants, Air pollution, Soil contamination, Wastes, Foods.
Identifiers: Survey radiation, Concentration.

The measurements of environmental radioactivity performed during 1968 by the Site Survey Group of the Protection Service are briefly described. Data are given on the concentrations of Strontium-90, Cesium-137, and other radionuclides in fallout, air, soil, waters, herbage, animal bones, and foods. (Houser-NSIC)
W71-09516

ASPECTS OF THE RELEASE OF RADIOACTIVE MATERIALS FROM NUCLEAR INSTALLATIONS INTO THE ENVIRONMENT AND THE CONSEQUENCES FOR THE DISPOSAL OF RADIOACTIVE SEWAGE. (IN GERMAN),
Staatliche Zentrale fuer Strahlenschutz, Berlin (East Germany).
W. Rohnsch.
Availability: USAEC Depository Libraries in the U.S. and Overseas. SZS-16/69, Dec 1969. 21 p, 1 tab, 8 ref.

Descriptors: *Environment, *Effluents, *Nuclear power plants, *Nuclear wastes, *Population, *Regulation, Standards, Surface waters, Radiation, Rivers, Oceans, Radioactivity effects, Water pollution sources.
Identifiers: Baltic Sea, Maximum permissible burden, Germany.

The importance of the environmental capacity for the release of radioactive materials from nuclear installations is pointed out. Its dependence on natural characteristics and the utilization of the environment as well as on the maximum permissible radiation burden of the inhabitants is discussed,

especially for surface waters. From the basic principle of radiation protection the request for a well-founded minimum exploitation of the environmental capacity is derived. An estimation of the capacity of the surface waters of the G.D.R. and the Baltic Sea shows that for a long time the disposal of low-level radioactive wastes is possible when all the possible means of the water processing facilities are applied and permanently improved. (Houser-NSIC)
W71-09518

RADIOACTIVE CONTAMINATIONS OF THE AREA AND THE ENVIRONMENT OF THE INSTITUTE OF NUCLEAR RESEARCH ZERAN CENTER IN 1968 YEAR (IN POLISH),
Institute of Nuclear Research, Warsaw (Poland).
Z. Gorberg, and J. Jaskulski.
Availability: NTIS. INR-1117, 1970. 17 p.

Descriptors: *On-site investigations, *Environment, *Radioactivity, *Radioecology, Fallout, Soil contamination, Vegetation, Water, Surface waters, Water pollution, Water pollution sources.
Identifiers: Corn, Grass, Concentration, Comparisons.

The investigation results of the radioactive contaminations of the area and environment of Institute of Nuclear Research-Centre Zeran in the year 1968 are represented. The radioactivity of the fallout, soil, grass, corn, waters and liquid wastes as the most representative materials of the Centre area and environment were investigated. For comparison, the average radioactive contaminations of those materials in the previous years are given. (Houser-NSIC)
W71-09519

LOW-LEVEL RADIOACTIVE WASTE TREATMENT - THE WATER RECYCLE PROCESS,
Oak Ridge National Lab., Tenn.
W. C. Yee, F. Delora, and W. E. Shockley.
Availability: NTIS. ORNL-4472, July 1970. 30 p.

Descriptors: *Waste water treatment, *Radioactive wastes, *Water quality, *Water reuse, Environment, Ion exchange, Water conservation, Water purification, Water quality act, Waste disposal.
Identifiers: Water recycling, Pilot plant, Waste disposal liquid.

The water recycle process was developed for decontaminating low-level radioactive aqueous wastes and recycling the purified water for reuse at nuclear installations. This process was successfully demonstrated through several cycles in a micropilot plant, using ORNL waste that contained low concentrations of salts and radionuclides. The recycle of water should be an improvement over present methods in which the wastes are decontaminated and the purified water is discharged to the environment. (Houser-NSIC)
W71-09522

RADIOACTIVITY TRANSPORT IN WATER-MATHEMATICAL SIMULATION,
Texas Univ., Austin.
Allen White, and Earnest F. Gloyna.
Availability: NTIS. ORO-19, EHE-70-04, CRWR-52, 1970. 40 p. AEC Contract AT- (11-1)-490.

Descriptors: *Radioactive wastes, *Ion transport, *Diffusion, *Mathematical model, *Dispersion, Discharge lines, Waste treatment, Sedimentation, Sorption, Absorption, Water pollution treatment.

A mathematical model has been developed for routing a radionuclide through a model river system. The capabilities include the following characteristics: (1) it distributes radionuclide activity by advective and dispersional mechanisms along the longitudinal axis of the system, (2) it may be discretized into any number of segments (vertical planes normal to the longitudinal axis) as may be appropriate to describe spatial variations in radionuclide activity, (3) it is capable of treating instantaneous, continuous, or time-varying releases of radionuclide activity, (4) it provides for a temporal description of radionuclide activity throughout the system, and (5) it provides for sorption and desorption by both plants and bottom sediments. (Houser-NSIC)
W71-09523

REPORT TO THE CONTRA COSTA COUNTY WATER AGENCY ON A STUDY OF THE EFFECTS OF THE PROPOSED FEDERAL SAN LUIS INTERCEPTOR DRAIN AND THE STATE SAN JOAQUIN VALLEY MASTER DRAIN.
Metcalf and Eddy, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 06G.
W71-09577

HYDRAULIC TESTING OF THE OJO ALAMO SANDSTONE IN HOLE GB-3, PROJECT GASBUGGY, RIO ARRIBA COUNTY, NEW MEXICO,
Geological Survey, Denver, Colo.
J. E. Weir, Jr.
Available from National Technical Information Service, Springfield, Va. - Price $3.00 printed copy; 95 cents microfiche. Geological Survey Open-file Report, USGS-474-91 (AEC), 1971. 26 p, 5 fig, 6 tab, 2 ref.

Descriptors: *Aquifer characteristics, *Groundwater movement, *Water pollution sources, *Nuclear explosions, *New Mexico, Bore holes, Fractures (Geology), Water level fluctuations, Permeability, Sandstones, Aquifers, Transmissivity, Radioactivity, Water analysis, Testing, Test procedures, Analytical techniques, Natural gas, Hydrologic data, Data collections, Geology, Hydrogeology, Water temperature, Groundwater, Chemical analysis, Water pollution sources, Radiochemical analysis, Path of pollutants.
Identifiers: *Aquifer evaluation, *Rio Arriba County (N Mex), Swabbing tests.

Hydraulic tests were made August 24 to September 2, 1969, in the Ojo Alamo Sandstone of Cretaceous age in hole GB-3, drilled about 20 months after the Gasbuggy explosion. The tests were made to determine whether increase in fracture permeability occurred as a result of the Gasbuggy experiment to stimulate gas production from a low yield reservoir by a nuclear explosion. The lower part of the formation, 3,564 to 3,686 feet below ground level, had a transmissivity (T) of 1.56 gallons per day per foot. Comparing this value with the value for T (2.64 gallons per day per foot), determined before the explosion for virtually the same stratigraphic interval in hole GB-1 in February 1967, suggests either that the Gasbuggy experiment fractured none of the lower Ojo Alamo Sandstone at hole GB-3 or that fracturing was insufficient to manifest itself through a permeability increase. A water sample from hole GB-3, as compared to a sample collected prior to the explosion from the same interval in hole BG-1, indicates a slight increase in radioactivity following the Gasbuggy experiment. (Woodard-USGS)
W71-09599

IMPROVEMENTS IN THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS,
Guelph Univ. (Ontario).
D. W. Lawson.
Supported by National Research Council of Canada. Water Resources Research, Vol 7, No 3, p 721-725, Jun 1971. 5 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Disperison, *Numerical analysis, Computer programs, Diffusion, Mixing, Groundwater movement, Seepage, Porous media, Equations, Mathematical models.
Identifiers: *Finite difference method.

Two modifications of Shamir and Harleman's two-equation scheme for the finite difference solution of two-dimensional dispersion problems are presented. These modifications improve both the accuracy and the efficiency of the solution. Shamir and Harleman's one-equation scheme is more efficient than the improved two-equation schemes, but it is not as accurate. (Knapp-USGS)
W71-09611

CHLORINATED HYDROCARBON INSECTICIDE CONTAMINATION OF STREAMBED SEDIMENTS IN THE MISSISSIPPI RIVER DELTA,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 05G.
W71-09630

DISTRIBUTION AND FORMS OF MERCURY IN GROUND-AND SURFACE WATERS IN A REGION OF MOLYBDENUM DEPOSITS (Russian: O rasprostranennosti i formakh nakhozhdeniya rtuti v gruntovykh i poverkhnostnykh vodakh v rayone molibdenovykh mestorozhdeniy),
Akademiya Nauk SSSR, Novosibirsk. Institut Geologii i Geofiziki.
L. A. Nepeina, and V. I. Sotnikov.
Akademiya Nauk SSSR. Sibirskoye Otdeleniye. Geologiya i Geofizika, No 12, p 121-125, December 1970. 5 p, 2 tab, 6 ref.

Descriptors: *Water chemistry, *Groundwater, *Surface waters, *Molybdenum, *Heavy metals, Salts, Connate water, Organic matter, Geochemistry.
Identifiers: *USSR, *Mercury, Transbaykal, Chita Oblast, Gorno-Altaysk Autonomous Region, Molybdenite, Mineralization, Country rock.

The content of mercury in ground- and surface waters of two molybdenum deposits in Eastern Transbaykal and in the Amazar River valley (Chita Oblast) and Sary-Dzhaz River basin (Kirghiz SSR) is more or less constant, varying between 1.8 and 5.6 millionths of a g/liter. Mercury in the water samples was determined in three forms: by total mercury content, by mercury precipitated by hydrogen sulfide, and by mercury bound in stable mercury organic compounds, which was most stable to long distance migration. The predominant form of mercury for all samples was Hg (OH)2. The mercury content in the waters examined was similar to that in the ground- and interstitial waters of the Aktash mercury deposit in the Gorno-Altaysk Autonomous Region. (Josefson-USGS)
W71-09644

BIOGEOCHEMICAL DISPERSION HALOS OF TIN IN A MONSOON CLIMATE OF THE SOUTHERN PART OF THE SOVIET FAR EAST (Russian: Biogeokhimicheskiye oreoly rasseyaniya olova v usloviyakh mussonnogo klimata yuga Dal'nego Vostoka),
Khabarovskii Kompleksnyi Nauchno-Issledovatelskii Institut (USSR).
V. V. Bardyuk, and P. V. Ivashov.
Akademiya Nauk SSSR. Sibirskoye Otdeleniye. Geologiya i Geofizika, No 12, p 125-132, December 1970. 8 p, 5 fig, 2 tab, 20 ref.

Descriptors: *Plants, *Soils, *Water chemistry, *Soil-water-plant relationships, Metals, Geochemistry, Biochemistry, Surface waters, Groundwater, Connate water, Aqueous solutions.
Identifiers: *USSR, *Maritime Territory, *Tin, *Dispersion halos, Silver, Lead, Ore bodies, Geobotany, Ash content.

Studies were conducted at several tin deposits in the coniferous forests of the Sikhote Alin and Myao-Chan range, using the biogeochemical method of prospecting to determine and explain tin distribution in plants and soils. Despite its extremely weak mobility in the supergene zone, tin produces true dispersion halos in plants growing above ore bodies in all of the landscape zones and does not form biogeochemical anomalies outside

the zones of mineralization. A tin content of 0.001% in the surface waters of an ore field and a tin content of 0.03-0.06% in the waters of an ore zone attest to the migration of tin in aqueous solutions. The tin concentration in the ash content of plants above an ore zone is 10-300 times that in non-ore areas. Tin and most other metals, including lead, copper and silver, are accumulated in soils in the lower part of the profile below 30-40 cm. A very weak relationship (0.1) exists between the tin content of soils and plants; a closer relationship (0.37) is observed for lead. The biogeochemical method precludes the possibility of 'false' biogeochemical anomalies of tin and provides for sharply contrasting anomalies, a large number of accumulator plants and simplified plant sampling. (Josefson-USGS)
W71-09645

PHYSICAL (HYDRAULIC) MODELING OF HEAT DISPERSION IN LARGE LAKES: A REVIEW OF THE STATE OF THE ART,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
Edward Silberman, and Heinz Stefan.
Available from National Technical Inf Service, Springfield, Va 22151 - Price $3.00 (printed copy); $0.95 (microfiche). Argonne National Laboratory Center for Environmental Studies Report ANL/ES-2, August 17, 1970. 110 p, 18 fig, 8 tab, 102 ref. Subcontract 31-109-38-2404 Argonne Nat Lab.

Descriptors: *Reviews, *Hydraulic models, *Bibliographies, *Dispersion, *Heated water, Thermal pollution, Thermal powerplants, Model studies, Path of pollutants, Mathematical models, Jets, Lakes.
Identifiers: Thermal plumes, Heat dispersion.

A survey was made of the state of knowledge of heat dispersion from steam generating plants into large lakes. The prospects and problems associated with physical or hydraulic modeling of thermal plumes and heat dispersion are reviewed. The studies reviewed include: physical concepts of thermal plumes derived from fundamental experimental studies and criteria for hydraulic modeling of dispersion; adaptability of hydraulic models to providing parameters for and checking of mathematical models; and case histories of hydraulic models applied to predicting thermal plumes at actual power plants. The materials reviewed include both published and unpublished literature, as well as direct interviews, mostly by long-distance telephone. (Knapp-USGS)
W71-09651

PESTICIDES IN WATER,
Federal Water Pollution Control Administration, Corvallis, Oregon. Pacific Northwest Water Lab.
Richard B. Marston, Robert M. Tyo, and Stephen C. Middendorf.
Pesticides Monitoring Journal, Vol 2, No 4, p 167-171, March 1969. 4 fig, 2 tab, 2 ref.

Descriptors: *Endrin, *Application methods, *Water pollution sources, *Watershed management, *Drainage, *Runoff, Seed treatment, Pesticide residues, Pesticide drift, Agricultural chemicals, Hazards, Forest management, Watersheds (Basins), Clear-cutting, Oregon.
Identifiers: Pesticide runoff, Salado (Oregon).

A 175 acre 'clear-cut' watershed in the headwaters of the Alsea River near Salado, Oregon was reseeded on January 23, 1967, by the conventional practice of aerially broadcasting endrin-coated Douglas Fir seed. Measurable amounts of endrin were detected in streamflow for 2 hrs after seeding started and again during the high flow of a winter freshet that occurred the sixth day after seeding. The total amount of endrin found in these two periods of runoff amounted to 0.006 lb/square mile, or 0.12% of the endrin used to treat the seed. This was much lower than the results obtained in the laboratory (11.3%) from soaking endrin-treated seed in distilled water for 32 days. (LeGore-Washington)
W71-09667

ON THE SIGNIFICANCE OF METAL COMPLEXING AGENTS IN SECONDARY SEWAGE EFFLUENTS,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
Michael E. Bender, Wayne R. Matson, and Robert A. Jordan.
Environmental Science and Technology, Vol 4, No 6, p 520-521, June 1970. 1 fig, 1 tab, 11 ref. FWPCA Grant 1-FI-WP-26-294-01, NIH Grant 5-501-FR-05447-07.

Descriptors: *Water pollution effects, *Organic wastes, *Eutrophication, *Chelation, *Sewage, *Organic compounds, Water pollution treatment, Water pollution sources, Environmental sanitation, Secondary treatment, Aquatic algae, Primary productivity, Trace elements, Phosphates, Nitrates, Laboratory tests.
Identifiers: *Chelators, Anodic stripping, Organic chelators.

Several components of secondary sewage other than phosphorous and nitrogen could be abetting lake eutrophication. The chelation of metals by organic compounds has been demonstrated to cause significant increases in algal production. This study was an attempt to find such chelators in secondary sewage effluents. Two distinct metal-complexing molecular weight fractions were demonstrated using recent advances in anodic stripping techniques. One fraction has a molecular weight similar to that of synthetic chelators and has proven effective in stimulating algal growth. Subsequent investigations are attempting to rule out the possibility that other substances in sewage fractions could be responsible for the apparent stimulation. (LeGore-Washington)
W71-09674

PRELIMINARY REPORT ON THE BENTHIC FAUNA OF THE RIVER TESHIO (In Japanese),
Mitsuaki Atoda, Kiyoshi Yoshizumi, Teruhiko Awakura, Toshitake Asano, and Tomiko Ito.
English summary. Scientific Reports of the Hokkaido Fish Hatchery, No 24, p 97-114, Dec 1969. 1 fig, 1 tab, 8 ref.

Descriptors: *Ecotypes, *Streambeds, *Benthic fauna, Speciation, Varieties, Stream erosion, Running waters, Aquatic animals, Insects, Midges, Stoneflies, Caddisflies, Mayflies, Oligochaetes, Resistance, Physiological ecology, Environmental effects.
Identifiers: *Stream fauna, Species diversity, Japan, Leeches, Earthworms, Gamarus sp, Teshio River Japan, Diversity.

The benthic fauna at eleven stations on the Teshio River, Japan, and at fourteen stations on twelve of its tributaries was examined. The upper Teshio River's benthos was diverse, and consisted largely of relatively sensitive organisms. From Nayoro City downstream, the species diversity decreased and a progressively larger proportion of the organisms were of 'tolerant' species. Six tributaries had 'good' bottom conditions and held diverse populations, but the other six tributaries contained poorly diversified faunal collections. The predominant bottom gravels and sands were considered the major influences on the poor species diversity in the lower Teshio River. (LeGore-Washington)
W71-09676

TOXICITY AND TREATMENT OF DE-INKING WASTES CONTAINING DETERGENTS,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
For primary bibliographic entry see Field 05C.
W71-09678

CAN GROUNDWATER POLLUTION BE AVOIDED,
Missouri Geological Survey, Rolla.
J. H. Williams.
Groundwater, Vol 7, No 2, p 21-23, March-April 1969.

Descriptors: *Water pollution, *Groundwater, *Missouri drilling, Water pollution control, Water pollution effects, Water pollution sources.
Identifiers: Missouri generalized geology.

Pollution of groundwater to the point of crisis in Missouri can be eliminated by an awareness of geology, by planning, by adequate funding, and by authority to follow planning. Groundwater pollution hazards are widespread in southern Missouri where permeable soils'1nd cavernous bedrock exist. Pollution in northern Missouri is more localized. All of the pollution in Missouri that we have attributed to geologic features could have been avoided if the polluters - municipal and private had obtained adequate geologic information, used common sense, and supported waste disposal plans with adequate financing. (Campbell-NWWA)
W71-09729

POLLUTION, PESTICIDES AND THE PEOPLE -- AGRICULTURE AND OUR NATURAL ENVIRONMENT.
Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept.
For primary bibliographic entry see Field 05C.
W71-09752

PESTICIDES,
Environmental Protection Agency, Washington, D.C. Pesticide Advisory Committee,
For primary bibliographic entry see Field 05C.
W71-09758

SEDIMENT: EVERYBODY'S POLLUTION PROBLEM,
Soil Conservation Service, Washington, D.C.
Kenneth E. Grant.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 67-76, 1 tab, 8 ref.

Descriptors: *Sediment, Water pollution effects, *Sedimentation, Agriculture, Soil erosion, Right-of-way, Soil, Farm waste, Water quality, Watersheds, Flood damage, Value, Benefits, Soil surveys, Research and development, Land management.
Identifiers: Nonfarm sources, Soil Conservation Service, Soil capability, Universal Soil Loss Equation, Wind Erosion Equation, Mulch tillage, Conservation Needs Inventory.

Sediment is the nation's largest pollutant. It is not only a pollutant in itself, but a carrier of animal wastes and chemical pollutants. Examples of the enormity of the sediment problem are cited. Nonfarm sources of sediment are a serious and growing problem. The fight against soil erosion has been headed by more than 3000 local soil and water conservation districts in the United States. A Conservation Needs Inventory indicates that 63% of all privately owned land (cropland, pasture, range, forest, other) needs some type of conservation treatment. Examples of the effectiveness of conservation treatment. Examples of the effectiveness of conservation measures are given. Continuing research and cooperation is needed between agencies and the general public in the resource conservation area. (See also W71-09752) (White-Iowa State)
W71-09760

SURFACE TEMPERATURE GRADIENTS OBSERVED IN MARINE AREAS RECEIVING WARM WATER DISCHARGES,
Bureau of Sport Fisheries and Wildlife, Tiburon, Calif. Tiburon Marine Lab.
James L. Squire, Jr.
Bureau of Sport Fisheries and Wildlife Technical Paper No. 11, January, 1967, 8 p., 6 fig., 2 tab., 6 ref.

Descriptors: *Thermal pollution, *Cooling water, Remote sensing, Outlets, Beaches, Fish, Water pollution sources.
Identifiers: Surface temperature, Coastal water.

Four outfall areas of steam electric generating plants in southern California were surveyed twice in early 1963. Equipment used for the survey was an infrared radiometer, a stripchart recorder, and associated power supply, mounted in a 4-place aircraft. During the first survey, the total cooling water output from the plants was 1.236 million gallons per minute heated 12.5F to 22F above intake temperatures at the plant sites. During the second survey, output was 1,187,400 gpm, heated 19F to 21F above intake temperatures. The four outfall areas surveyed were Redondo Beach, Alamitos, Huntington Beach and Carlsbad-Encina. Surface temperature increases above ambient on the two surveys were 4.2 and 4.0 for Redondo Beach, 17.0 and 20.0 for Alamitos, 7.2 and 6.5 for Huntington Beach and 8.0 and 4.0 for Carlsbad-Encina. Since observations were of surface gradients, the extent of mixing at depth was not determined. It is conceivable that large volumes discharge in the surf zone could impede the migration of such fish as drums (Scianidae) and surf perches (Embiotocidae). On the other hand, warm discharges are known to occasionally attract marine game species such as bonito (Sarda Chiliensis) and barracuda (Sphyraena Argentea). (Upadhyaya-Vanderbilt)
W71-09769

FOSSIL FUELS AS A SOURCE OF MERCURY POLLUTION,
Miami Univ., Fla. Rosenstiel School of Marine and Atmospheric Sciences.
Oiva I. Joensuu.
Science, Vol. 172, June 4, 1971, p. 1027-1028, 1 tab., 11 ref.

Descriptors: Environment, Leaching, Fungicides, Water pollution sources.
Identifiers: Mercury pollution, *Fossil fuels, *Mercury.

The buildup of mercury in the biomass is a recent phenomenon. A large part of the mercury found in the environment is apparently derived from industrially produced mercury, (about 10,000 tons per year) most of which is eventually discarded in waste streams. Amounts used as fungicides in treatment of grain seeds are much too small to explain high mercury contents in wildlife except in grain eating birds. To obtain an estimate of amount of mercury in coal, 36 American coals were analyzed by means of a mercury vapor detector. The average of the results (3.3 ppm) cannot be applied to total coal production. Applying a conservative estimate of 1 ppm, it is concluded that 3000 tons of mercury per year is released from the yearly production of 2 billion tons of coal. An upper limit of 230 tons per year for leached mercury by weathering is obtained by comparison with corresponding figures for sodium. (Upadhyaya-Vanderbilt)
W71-09770

THE COMPLEX CHEMISTRY OF METHYLMERCURY CATIONS (IN GERMAN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. of Inorganic Chemistry.
For primary bibliographic entry see Field 05A.
W71-09772

MERCURY IN THE AIR.
Committee for Environmental Information.

Environment, Vol. 13, No. 4, p. 24-33, May, 1971, 4 fig., 1 table, 9 ref.

Descriptors: *Heavy metals, *Air pollution, *Pollutant identification, *On-site tests, Incineration, Powerplants, Industrial plants, Spectrometers, Water pollution sources.
Identifiers: *Mercury, *Air emissions, *Concentration levels, *Annual output, Mercury vapors.

A recent airborne survey conducted by the Committee for Environmental Information revealed that the annual mercury vapor discharge from some coal burning powerplants, municipal incinerators and several industrial plants may range from 100-5400 pounds per year at individual sites. The estimated annual rate of mercury vapor discharge from only 12 locations in Missouri and Illinois exceeds the rate of mercury discharge into waterways by the nation's 50 major mercury polluters. Measurements were made with the Barringer Airborne Mercury Spectrometer, from a helicpoter. Obtained concentration ranges and estimated rates of output from some 15 powerplants, 4 incinerators and 8 industrial plants are compiled, followed by a brief discussion of possible sources of mercury. It is pointed out that the study was made in winter, when vapor readings would be lowest. (Oleszkiewicz-Vanderbilt)
W71-09775

MERCURY IN THE ENVIRONMENT,
Terri Aaronson.
Environment, Vol. 13, No. 4, p. 16-23, 4 fig.

Descriptors: *Heavy metals, *Public health, *Environmental effects, *Food chains, Air pollution, Water pollution sources, Industrial plants, Standards, Jurisdiction, Circulation, Path of pollutants, Human diseases, Agricultural chemicals, Foods, Toxicity.
Identifiers: *Mercury, *Methyl mercury, *Maximum Permissible Level, Intake levels, Emissions, Symposium summary.

A resume of the symposium on 'Mercury in Man's Environment' held by the Royal Society of Canada in Ottawa on February 15 and 16 is presented. Various topics have been discussed during that meeting, among others: (1) present and past sources of mercury in the environment agriculture accounts for about 4% of the total mercury consumed annually in the USA; thermometers broken in homes and hospitals in Canada annually release to the environment 14,000 pounds of elemental mercury; (2) levels of mercury contamination - food chains; (3) biological and medical aspects of mercury pollution, and (4) maximum permissible levels of mercury contamination of food-stuffs. The author concludes that despite the hundred-year history of mercury pollution, its sources are only now being traced. Power plants, incinerators, chemical plants, and perhaps hospitals and laboratories, are major modern sources of the 23 million pounds of mercury released worldwide each year. (Oleszkiewicz-Vanderbilt)
W71-09776

TWO LAYER STRATIFIED FLOW IN CONVERGING SECTION,
Water Economics Research Inst., Warsaw (Poland).
W. Poplawski.
In Polish with English summary. Archiwum Hydrotechniki, Vol. XVII, No. 3, p. 365-378, 1970. 8 fig., 7 ref.

Descriptors: *Laboratory tests, *Mixing, *Stratified flow, *Hydraulic models, *Froude number, *Density stratification, *Mathematical models, Fluid friction, Velocity, Distribution pattern, Outlet works, Hydraulic conduits, Heated water, Waste water disposal.
Identifiers: *Densimetric Froude number, *Fluid motion equations, Bresse's equation, TVA Engineering Laboratory.

Laboratory studies are presented on determination of the minimum densimetric Froude number, necessary to enforce complete mixing of wastewater introduced to river with a density different from that of the ambient fluid. The studies, conducted at the TVA Engineering Laboratory at Norris, resulted in the following conclusions: (1) The construction of an approximate mathematical model on the basis of a set of fluid motion equations probably yields better results than attempts at purely empirical correlations. (2) Rapid mixing cannot be expected in rivers where the densimetric Froude number (F') is equal to 1.0. Outlet construction should create sufficient velocity of discharge that the minimum F' — 5 be obtained and in the case of deep rivers this number should be even higher. (Oleszkiewicz-Vanderbilt)
W71-09777

MERCURY IN MAN,
Washington Univ., Seattle. School of Medicine.
For primary bibliographic entry see Field 05C.
W71-09778

NOTE: FORMATION OF METHYL MERCURY FROM PURE MERCURIC SULPHITE IN AEROBIC ORGANIC SEDIMENT,
Swedish Water and Air Pollution Lab., Stockholm (Sweden).
Torbjorn Fagerstrom, and Arne Jernelov.
Water Research, Pergamon Press, Vol. 5, No. 3, p. 121-122, 1971, 3 ref.

Descriptors: *Heavy metals, *Sediments, *Aerobic methylation, Laboratory tests, Toxicity, Aquaria, Water pollution control.
Identifiers: *Methyl mercury formation, *Biological methylation, *Mercuric sulphide, Mercury.

The formation of methyl mercury in aerobic organic sediments has been studied. It has been shown in the laboratory that even the form of pure mercuric sulphite is available for biological methylation. The speed of the methylation process, however, is considerably lower than when mercury is present as inorganic divalent mercury. The amount of methyl mercury formed from added mercuric sulphide corresponds to the amount formed from inorganic divalent mercury at a concentration of .0010 of that for mercuric sulphide. (Oleszkiewicz-Vanderbilt)
W71-09779

PRACTICAL REMOTE SENSING, THE USE OF A THERMAL MAPPER IN STUDIES OF COOLING WATER DISCHARGES FROM OPERATING THERMAL POWER PLANTS,
Pacific Gas and Electric Co., Emeryville, Calif.
For primary bibliographic entry see Field 07B.
W71-09780

THERMAL DISCHARGES: CHARACTERISTICS AND CHEMICAL TREATMENT OF NATURAL WATERS USED IN POWER PLANTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05D.
W71-09782

MERCURY IN THE ENVIRONMENT,
L. J. Goldwater.
Scientific American, Vol. 224, No. 5, p 15-21, May, 1971, 8 fig.

Descriptors: *Heavy metals, *Toxicity, *Public health, Environmental effects, Food chains, Industrial production, Circulation, Epidemiology, Water pollution, Air pollution, Solid wastes, Chromosomes.
Identifiers: *Mercury, *Methyl mercury, Mercury demand, Mercury industry, Cinnabar deposits, Aquatic life, Lithosphere, Biosphere.

Review of the present state of affairs regarding mercury in the environment suggests that the best way to deal with the problem is to apply the techniques of epidemiology, preventive medicine, public health and industrial hygiene that have been effective in meeting hazards in the past. A system should be set up for frequent monitoring of the environment for the detection of significant increases in mercury contamination. Distribution of various forms of mercury is presented followed by the discussion of the mercury cycle in the lithosphere, hydrosphere, atmosphere and biosphere, as well as

conversion of the metal into methyl mercury in the aquatic food chain and in the sediments. Industries responsible for direct and indirect discharge of mercury into the environment are outlined. Atmospheric mercury levels measured at San Francisco (including some above 0.02 micrograms/cubic meter) and concentration levels found in food are presented; some biological effects of ingestion are also discussed. A need is noted for a better understanding of what should be considered a toxic level of mercury in the human body. (Oleszkiewicz-Vanderbilt)
W71-09787

A WATER RESOURCE-WATER SUPPLY STUDY OF THE POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
Norbert A. Jaworski, Leo J. Clark, and Kenneth D. Feigner.
Environmental Protection Agency, Water Quality Office, Technical Report 35, April 1971, 263 p, 39 tab.

Descriptors: *Estuaries, *Water quality, *Water resources development, *Water supply, Waste water, Runoff, Dissolved oxygen, Algae, Nutrients, Bacteria, Viruses, Heavy metals, Human population, Waste water treatment, Water quality control.
Identifiers: Potomac Estuary.

A detailed investigation of the water quality and water resources of the Potomac Estuary was conducted by the Chesapeake Technical Support Laboratory. Included in the study were an evaluation of pollution sources including nutrients; the development of mathematical models to predict pollutant effects on water quality; the projection of water supply needs and wastewater loadings; an evaluation as a potential water supply source; the determination of the maximum pound loadings by zone for certain pollutants under different flow conditions; alternative waste treatment plans and cost analysis of wastewater treatment. (Ensign-PAI)
W71-09788

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES. PART I. EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES.
Quirk, Lawler and Matusky Engineers, New York.

Available from the Clearinghouse for Federal, Scientific and Technical Information, Bureau of Standards, U.S. Dept. of Commerce, Springfield, Virginia, $3.06. Atomic Energy Commission Report NYO 39611, August 1969, 197 p, 44 fig, 27 tab, 73 ref.

Descriptors: *Estuaries, *Water pollution control, *Radioisotopes, *Fluorescence, *Dye releases, *Dispersion, Tracers, On-site investigations.

The relative merits of using radiotracers and fluorescent dyes for determining longitudinal dispersion coefficients in estuaries were evaluated. Areas where radiotracers would provide a feasible means of estimating the mass transport parameter were delineated. Evaluation of more than 100 radioisotopes and fluorescent dyes showed only eighteen suitable as field tracers. The eighteen tracers were compared on the basis of selected mathematical models. Analysis showed that there are advantages and limitations to both groups of tracers. Radiotracers seem to meet the technical requirements of an ideal tracer better than other materials. However, non-technical aspects such as approval and licensing by various governmental agencies, adverse public reaction, handling, safety and personnel can be problems. These aspects are important advantages of using dyes as field tracers. (Ensign-PAI)
W71-09791

MERCURY IN WASHINGTON STATE,
Washington State Dept. of Ecology, Olympia.
Ronald A. Lee.
Report of Mercury Sampling and Analysis, Spring 1970-Spring 1971, January, 1971, 22 p, 9 tab.

Descriptors: *Industrial wastes, *Municipal wastes, *Pollutants, *Distribution patterns, Sediments, Washington.
Identifiers: *Mercury, Chlorine-alkaline plant outfall.

From the spring of 1970 to the spring of 1971 mercury levels in Washington state waters and sediments from industrial and municipal waste waters were investigated. A listing of data collected to determine the occurrences and distribution of mercury in Washington, in accordance with state regulation and control of unnatural mercury discharges are contained in the results. (Ensign-PAI)
W71-09792

PARTICULATE Pb, Pb 210 AND Po 210 IN THE ENVIRONMENT,
Batelle Memorial, Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05A.
W71-09799

NATIONAL MONITORING PROGRAM FOR THE ASSESSMENT OF PESTICIDE RESIDUES IN WATER,
Geological Survey, Arlington, Va; and Environmental Protection Agency, Washington, D.C.; and Water Quality Office, Athens, Ga.
For primary bibliographic entry see Field 05A.
W71-09802

RUNOFF OF DEICING SALT: EFFECT ON IRONDEQUOIT BAY, ROCHESTER, NEW YORK,
Rochester Univ., New York. Dept. of Geological Sciences.
Robert C. Bubeck, William H. Diment, Bruce L. Deck, Alton L. Baldwin, and Stewart D. Lipton.
Science, Vol 172, No. 3988, p 1128-1132, June 11, 1971. 5 p, 4 fig, 13 ref. NSF Grant GA-11146, NOAA SEA Grant GH-106.

Descriptors: *Water pollution effects, *Salinity, *Lake Ontario, *New York, *Snow removal, Deicers, Melting, Salts, Chlorides, Density, Density stratification, Thermal stratification, Turnovers, Mixing.
Identifiers: *Irondequoit Bay (N.Y.).

Salt used for deicing the streets near Rochester, New York, has increased the chloride concentration in Irondequoit Bay at least fivefold during the past two decades. During the winter of 1969-70 the quantity and salinity of the dense runoff that accumulated on the bottom of the bay was sufficient to prevent complete vertical mixing of the bay during the spring. Comparison with 1939 conditions indicates that the period of summer stratification has been prolonged a month by the density gradient imposed by the salt runoff. (Knapp-USGS)
W71-09803

CONVOLUTION APPROACH TO THE SOLUTION FOR THE DISSOLVED OXYGEN BALANCE EQUATION IN A STREAM,
Geological Survey, Fort Collins, Colo.
James P. Bennett.
Water Resources Research, Vol 7, No 3, p 580-590, June 1971. 11p, 4 fig, 17 ref.

Descriptors: *Water pollution control, *Waste assimilative capacity, *Dissolved oxygen, *Biochemical oxygen demand, *Oxygen demand, Mathematical models, Water pollution effects, Path of pollutants, Oxygen sag, Numerical analysis, Self-purification.
Identifiers: *Oxygen balance (Streams).

In terms of its response to biochemical oxygen demand (BOD) and dissolved oxygen (DO) inputs, a natural waterway may be treated as a system governed by the BOD and DO balance differential equations. Using the response of the DO balance differential equation to impulse inputs of DO and BOD, one can compute by convolution the response of the system to arbitrary BOD and DO inputs. The convolution technique requires numerical integration, but it is not a numerical solution to a differential equation; it therefore avoids the stability problems inherent in such solutions. The convolution technique permits consideration of longitudinal dispersion in systems that have time varying DO and BOD inputs, a situation that could previously be investigated only by numerical solutions to the basic differential equations. Examples show the capability of the convolution tehcnique to reproduce field data and to match previously developed analytical and numerical techniques. (Knapp-USGS)
W71-09820

UNSOLVED PROBLEMS OF AQUATIC RADIOECOLOGY,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
G. G. Polikarpov.
Available from NTIS. Report AEC-tr-7171, p 121-136 (Radiobiologiya, Vol. 10, No. 2, p 242-252 (1970)) 10 fig, 2 tab, 32 ref.

Descriptors: *Radioecology, *Nuclear wastes, *Fallout, Aquatic life, Absorption, Radionuclides, Strontium radioisotopes, Water pollution effects.
Identifiers: Yttrium radioisotopes, Cerium radioisotopes, Cesium radioisotopes.

On the basis of an analysis of the present state of aquatic radioecology, the most important problems with respect to the protection of nature are discussed: (1) determination of the role of the physicochemical state of radionuclides in the radioecological concentration processes; and (2) disclosing the mechanisms of the penetration, accumulation, and distribution of radionuclides in living systems. (Bopp-NSIC)
W71-09847

RADIOACTIVITY CONTENTS IN SOME PLANKTON AND SEA WATER SAMPLES COLLECTED DURING THE PERIOD BETWEEN 1960 AND 1968,
Parma Univ. (Italy).
For primary bibliographic entry see Field 05C.
W71-09857

RADIOACTIVITY AND FALLOUT: THE MODEL POPULATION,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 05C.
W71-09860

RADIOACTIVITY TRANSPORT IN WATER: SUMMARY REPORT,
Texas Univ., Austin. Center for Research on Water Resources.
Yousef A. Yousef, Akira Kudo, and Earnest F. Gloyna.
Available from NTIS. ORO-490-20 (Feb. 1970). 80 p, 28 fig, 18 tab, 27 ref.

Descriptors: *Radioisotopes, *Mathematical models, *Ecosystems, Movement, *Path of pollutants, Persistence, Hydraulic transportation, Hydraulic properties, Sedimentation, Sediment transport, Absorption, Computer programs, Biomass, Water pollution sources.

A transport model is presented which describes the behavior of radionuclide movement in an ecosystem, and considers hydraulic transport, sediment sorption and desorption, and biomass uptake and release. Solutions of the transport model are programmed and verified using data obtained from

the laboratory ecosystem and the research flume. The limitations and relative importance of environmental factors affecting transport are evaluated, and recommendations for the use of this prediction model are discussed. (Bopp-NSIC)
W71-09861

ENVIRONMENTAL RADIOACTIVITY, ISPRA 1969,
European Atomic Energy Community, Ispra (Italy).
M. D. Burtoli, and P. Gaglione.
Availability: NTIS. Report EUR-4563e, 1970, 50 pages.

Descriptors: *Environment, *Monitoring, *Radioactivity, *Measurement precipitation (Atmospheric), Air pollution, Water pollution, Water pollution sources, Fallout, Vegetation, Food chains, Milk, Fish, Animals, Food and Cover Crops, Strontium radioisotopes, Cesium.
Identifiers: Surveillance Program, Concentration, Calcium, Radium.

Briefly described are the measurements of environmental radioactivity performed during 1969 by the site survey group of the protection service of the Euratom Ispra establishment. Data are given on the concentrations of Strontium-90, Cesium-137, and other radionuclides in precipitation, air, waters, herbage and foods. The origin of the contamination is mainly world-wide fallout. (Houser-NSIC)
W71-09862

INFLUENCE OF THE PHYSIOCOCHEMICAL FORM OF RUTHENIUM ON CONTAMINATION OF MARINE ORGANISMS, (In French),
Departement de la Protection Sanitaire, Cherbourg (France). Section de Radio-ecologie.
Pierre Guegueniat, Pierre Bovard, and Jacques Ancellin.
Comptes Rendus, Series D, Vol 268, Feb 10, 1969, p 976-979.

Descriptors: *Marine animals, *Marine plants, Radioisotopes, Physicochemical properties, Anion adsorption, Colloids, Aquaria, Absorption, Water pollution effects, Cation exchange, Cation adsorption, Hydrolysis, Marine algae, Invertebrates, Nuclear wastes, Water pollution sources.
Identifiers: *Ruthenium radioisotopes.

The derivatives of ruthenium nitrosyls from effluents of fuel reprocessing plants were found in various physicochemical forms in sea water - as precipitates, in solution, or in colloidal form. The form in which the ruthenium was present depended upon the amounts of other suspended material in the sea water. Experiments in aquaria showed that ruthenium present in precipitates caused more contamination of marine algae and invertebrates as compared with soluble (cationic) ruthenium. (Bopp-NSIC)
W71-09863

STUDY OF THE DISTRIBUTION OF RUTHENIUM IN AN ECOLOGICAL POND USING NEUTRON ACTIVATION ANALYSIS, (In French),
Centre d'Etude de l'Energie Nucleaire, Grenoble (France). Laboratoire de Biologie Vegetale.
M. Neuburger, and A. Fourcy.
International Journal of Applied Radiation and Isotopes, Vol 20, p 641-651 (1969). 9 fig, 7 tab, 7 ref.

Descriptors: *Lakes, *Neutron activation analysis, *Nuclear wastes, Aquatic plants, Amphibious plants, Lake soils, Sediments, Water pollution sources, Pollutant identification.
Identifiers: *Ruthenium radioisotopes.

Ruthenium is one of the components of radioactive wastes issued from nuclear experimentation. As ruthenium radioisotopes have the same biological behaviour as stable ruthenium, it is suggested to study the partition of a low intake of non-radioactive ruthenium in an ecological pond which is initially nearly free of natural ruthenium. For this purpose, water, sediments, aquatic and semiaquatic plants are periodically taken off and analyzed according to an original technique, using neutron activation analysis. (Bopp-NSIC)
W71-09864

A SUMMARY OF WATER POLLUTION PROBLEMS IN THE LAKE MICHIGAN BASIN,
Toltz, King, Duvall, Anderson and Associates, Inc., St. Paul, Minn.
Harry Cleveland Grounds.
In: Proceedings, Tenth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc., 1967, p 420-426.

Descriptors: *Water pollution sources, *Water quality, Water pollution control, Industrial wastes, Population, Government, Rivers, Watersheds, Basins, Costs, Financing, Sewerage, Waste treatment, Taxes.
Identifiers: *Lake Michigan, *Waste load, Pulp and paper industry, Pollution zones.

The water pollution problems in the Lake Michigan watershed zones are surveyed, including the waters of the Calumet region in Illinois and Indiana, the Green Bay are in Wisconsin and Michigan, and parts of the St. Joseph, Grand, Kalamazoo and Muskegon Rivers in Indiana and Michigan. The major source of pollution of these waters is the industrial wastes from industries supporting the watershed's 5.5 million population. These include pulp and paper manufacturers, petro-chemical processes, steel manufacture, and food processing. Wastes from these industries exceed the basin population in terms of population equivalents, boosting the waste load to approximately equal the raw wastes of some 6 million persons. The efficacy of various water pollution control agencies, enforcement agencies, and pollution measures is cited and indications are made that such agencies are working with local government and industry to improve present water quality and insure its protection for future use. (Murphy-Rutgers)
W71-09883

5C. Effects of Pollution

THERMAL POLLUTION IN THE MARINE ENVIRONMENT,
New York State Dept. of Conservation, Albany. Div. of Marine and Coastal Resources.
Albert C. Jensen.
The Conservationist, Vol 25, No 2, p 8-13, Oct-Nov 1970. 5 fig.

Descriptors: *Thermal pollution, Commercial fishing, Project planning, Ecology.
Identifiers: *New York State's Marine District, Hudson River, Long Island Sound.

If adequate ecological planning is not undertaken before the construction of a power plant, the damage to the fishing industry from thermal pollution can be substantial. Although, at the present time, eighty percent of New York State's Marine Districts thermal pollution comes from electric power plants, the plans for construction of massive nuclear power plants could have more serious consequences because they are planned for areas where the pollution level is still low. (Holmes-Rutgers)
W71-09480

STUDY OF TRITIUM HAZARDS,
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre D'Etudes Nucleaires.
B. Vaubert, and R. Bittel.
Availability: NTIS. CEA-BIB-182, EUR-4522F, Sep 1970. 47 p.

Descriptors: *Tritium, *Bibliographies, *Radiation, *Radioisotopes, *Hydrogen, Oxygen, *Water, *Gases, Chemical reactions, Hazards, Radiochemical analysis, Transfer, Environment, Meteoric water, Aquifers, Absorption, Biological communities, Inhalation, Environmental effects, Biological properties.

In this bibliography the following points were considered: nuclear characteristics, tritium production processes and resulting potential hazards; tritium behavior towards hydrogen and several hydrogenated compounds; detection and radiochemical determination; environmental transfers, with emphasis on tritium behavior in the presence of atmospheric water and in various aquifer systems; some biological considerations of absorption, inhalation, and dosimetry; and radiobiology in order to characterize effects caused by the nuclear characteristics of tritium. (Houser-NSIC)
W71-09493

ROLE OF FRESHWATER PLANTS IN THE COPRECIPITATION OF STRONTIUM-90 WITH CALCIUM CARBONATES (IN RUSSIAN),
N. V. Kulikov, S. A. Lyubimova, and N. A. Timofeeva.
Ekologiya, No 4, p 55-8, 1970. 4 tab, 12 ref.

Descriptors: *Strontium radioisotopes, *Cyanophyta, *Chlorophyta, *Adsorption, Calcium carbonate, Chemical precipitation, Absorption, Surface.

Strontium-90 was present in a calcium carbonate precipitate on freshwater plant surfaces, both in aquariums and in natural habitats. About one order of magnitude more strontium was present in the precipitate than within plant tissures. The discrimination coefficient, (strontium-90/calcium in the precipitate)/ (strontium-90/calcium in water) was independent of the calcium concentration in water and the value between different plants varied from 0.34 to 1.25. Formation of the precipitate probably occurs through a reaction of calcium and strontium cholorides with sodium carbonate which is induced by metabolic processes. (Bopp-ORNL)
W71-09501

COLUMBIA RIVER STUDIES, ANNUAL PROGRESS REPORT, 1969-1970,
Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T-1-2, Jun 22, 1970. 30 p, 2 app.

Descriptors: *Ecology, *Ecosystem, *Columbia River, *Temperature, *Radioactivity effects, *Oysters, *Mussels, *Phytoplankton, Absorption, Iron, Life cycles, Zinc, Environment, Monitoring.

Six research programs were completed or were in progress at the radiation ecology laboratory during the 1969 to 1970 reporting period. These included effects of temperature and ionizing radiation on the larvae of the Pacific oyster; effects of shock temperature and ionizing radiation on phytoplankton; uptake of Fe-55 by mussels from the Washington coast (1962 to 1969); zinc biological half-life for oysters in a natural environment; dose measurements with thermoluminescent dosimeters; and monitoring of mussels from Washington waters for Zn-65. Results from each phase of the research program are briefly discussed. (See also W71-09505 thru W71-09509) (Houser-NSIC)
W71-09504

COLUMBIA RIVER STUDIES 1969-1970, UPTAKE OF Fe-55 BY MUSSELS FROM THE WASHINGTON COAST, 1962-1969,
Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 2-5.

Descriptors: *Ecology, *Ecosystems, *Absorption, *Aquatic life, *Biology, *Columbia River, *Mussels, *Fallout, *Radioactivity effects, Animals, Animal population, Iron, Life cycles.

Fe-55 in fallout and mussels are related. The pattern of Zn-65 in mussels is not unlike that in lichen and moss from northern Sweden for the years 1962-1966, although the actual values for mussels are about 1/10 the lichen and moss values. Mussels probably take up iron rapidly, but the biological half-life is greater than the physical half-life of Fe-55. (See also W71-09504) (Houser-NSIC)
W71-09505

COLUMBIA RIVER STUDIES 1969-1970, ZINC BIOLOGICAL HALF-LIFE FOR OYSTERS IN A NATURAL ENVIRONMENT,
Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T1-2, June 22, 1970, p 5-9.

Descriptors: *Columbia River, *Ecology, *Ecosystems, *Absorption, *Oysters, *Zinc radioisotopes, Life-cycles, Biology, Environment, Environmental effects, Radioactivity effects.

The biological half-life for ZN-65 may be as short as 100 days for the summer months (perhaps for a spawning oyster) or as long as 1,350 days. Average values for 9 oysters for the first 15 months of the experiment were 158 days for effective half-life and 538 days for biological half-life. (See also W71-09504) (Houser-NSIC)
W71-09506

COLUMBIA RIVER STUDIES 1969-1970, MONITORING OF MUSSELS FROM WASHINGTON WATERS FOR ZINC-65,
Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 10-13.

Descriptors: *Nuclear power plants, *Zinc radioisotopes, *Mussels, *Columbia River, *Harbors, *Radioactivity effect, Monitoring, Sampling, Aquatic animals, Ecology, Water pollution, Water pollution effects, Water pollution sources.

The primary objective is to relate the output of Zn-65 from the Hanford reactors with the ZN-65 values in mussels from Washington waters. The samples were collected at the mouth of the Columbia River, along the ocean coast and the Straits of Juan de Fuca and in Puget Sound. A secondary objective is to relate the ZN-65 value in mussels with distance from the mouth of the Columbia River. Of the eight original production reactors at Hanford, seven have been shut down between January 1965 and February 1970. As a consequence, the amount of Zn-65 in mussels has decreased, with the most significant decrease occurring near the mouth of the Columbia River, where the concentration of Zn-65 is the greatest. (See also W71-09504) (Houser-NSIC)
W71-09507

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF TEMPERATURE AND IONIZING RADIATION ON THE LARVAE OF THE PACIFIC OYSTER,
Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 1. App A.

Descriptors: *Columbia River, *Oysters, *Temperature, *Radioactivity effects, *Life cycles, *Ecosystems, *Tritium, *Zinc radioisotopes, Aquatic animals, Biology, Absorption, Water pollution, Thermal pollution, Water pollution effects, Water pollution sources.

The experiments showed that temperature effects occurred between 24C and 28C and that radiation effects occurred at H-3 and Zn-65 concentrations of 10 3 Ci/liter. However, no effects of the interaction between temperature and radiation were observed and, the life stage at time of irradiation was not a factor in producing abnormal larvae. A detailed discussion of these experiments is given. (See also W71-09504) (Houser-NSIC)
W71-09508

COLUMBIA RIVER STUDIES 1969-1970, EFFECTS OF SHOCK TEMPERATURE AND IONIZING RADIATION ON PHYTOPLANKTON,
Washington Univ., Seattle. Lab. of Radiation Ecology.
Allyn Seymour.
Availability: NTIS. RLO-2225-T-1-2, June 22, 1970, p 2, App B.

Descriptors: *Radioactivity effect, *Thermal pollution, *Water pollution, *Water pollution effect, Water pollution sources, *Phytoplankton, Aquatic fungi, Columbia River, Ecology, Ecosystem.

The objective was to determine the effects of short time temperature changes, of ionizing radiation, and of temperature changes plus ionizing radiation on phytoplankton organisms as measured by their ability to use carbon in the photosynthetic process. The experiments were designed to measure primary productivity in water used as the secondary coolant for nuclear reactors. Although the amount of radionuclides in the discharge water will be very small, the radiation phase of the experiment will be of academic interest. The temperature effects on primary production are of considerable ecological significance since primary production is the foundation for all higher trophic levels. (See also W71-09504) (Houser-NSIC)
W71-09509

EVALUATION OF RADIOLOGICAL CONDITIONS IN THE VICINITY OF HANFORD FOR 1967.
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

Availability: NTIS. BNWL-983, March 1969. 87 p, 30 fig, 11 tab, 17 ref, and BNWL-983 Feb 1969, (App.). 139 p.

Descriptors: *Waste water disposal, *Effluents, *Water pollution sources, *Waste water (Pollution), Water pollution control, Monitoring, Environment, Sedimentation, Columbia River, Population, Diets.

Controlled releases of a variety of low-level radioactive wastes are made to the Columbia River, to the ground, and to the atmosphere. The major source of low-level wastes released to the environment in 1967 continued to be reactor cooling water discharged to the Columbia River. Evaluation of the combined offsite effects of all radioactive waste releases during 1967 showed that concentrations of radionuclides in the environs and radiation doses received by nearby population groups were well within accepted limits. Estimates were made of the whole body, gastrointestinal tract, and thyroid doses and the annual intake of bone-seeking nuclides. Population groups considered included Maximum Individuals and typical Richland residents, and for the first time Richland residents. Diet information accumulated from plant employees permitted calculation of both average dose values and dose distribution for Richland residents. The only population dose estimate exceeding one-tenth of the appropriate limit was 12% of the Maximum Permissible Rate of Intake to the bone of a hypothetical Maximum Individual, with P-32 contributing 99% of the estimated dose and Columbia River fish the major source of intake. (Houser-NSIC)
W71-09510

PHOSPHATE MEASUREMENTS IN NATURAL WATERS, A CRITIQUE,
Minnesota Univ., Minneapolis. Limnological Research Center.
For primary bibliographic entry see Field 05A.
W71-09557

IMPOUNDMENT EFFECTS ON WATER QUALITY AS REFLECTED IN PARASITISM OF RESERVOIR BASSES,
Arkansas Univ., Fayetteville. Water Resources Research Center.
David A. Becker.
Available from the National Technical Information Service as PB-200 826, $3.00 in paper copy, $0.95 in microfiche. Technical Completion Report, Water Resources Research Center, 1971, 10 p, 13 ref. OWRR Project A-009-ARK (5).

Descriptors: *Fish parasites, *Bass, Pre-impoundment, Early impoundment, Dispersion, Fluctuation, Aging, Growth rates, Sport fish, Water pollution effects, *Impoundments, Fish, *Parasitism.
Identifiers: Black bass, Helminth parasites, Copepod parasites.

Field investigations involved live collections of the black basses Micropterus dolomieui Lacepede, M. punctulatus (Rafinesque), and M. salmoides (Lacepede). Basses were examined in the laboratory for helminth and copepod parasites in an effort to follow the quantitative and qualitative dispersions and fluctuations of these parasites as the water quality is effected by the water level fluctuations from a river to a reservoir environment. Standard and total length, weight, and scale samples were obtained to ascertain the effect of parasitism on the aging and growth rates of basses which may help explain why sport fishing declines after several years in recently impounded reservoirs effecting the recreational economy of the municipalities surrounding reservoirs. Parasitism were related to the whole food chain in an attempt to establish another parameter for water quality. The comparison of pre- and post-impoundment data was stressed. Results were also compared with other studies involving newly impounded reservoirs. (Babcock-Arkansas)
W71-09559

PHYTOPLANKTON DYNAMICS AND PRODUCTIVITY IN A SHALLOW, HIGHLY EUTROPHIC LAKE: WITH SPECIAL REFERENCE TO MELOSIRA AMBIGUA (GRUN.) O. MULL. AND M. GRANULATA (EHR.) RALFS,
Wisconsin Univ., Madison. Water Resources Center.
William E. Sloey.
Doctor of Philosophy Thesis, Dept of Botany, University of Wisconsin-Milwaukee, 1969, 162 p, 22 fig, 6 tab, 126 ref. OWRR Project A-011-WIS (2).

Descriptors: *Phytoplankton, *Diatoms, *Turbulence, *Aquatic plants, *Water temperature, *Dissolved oxygen, *Dissolved solids, *Lake, *Water chemistry, Wisconsin, *Eutrophication.
Identifiers: *Population dynamics, *Melosira granulata (Ehr) Ralfs, *M ambigua (Grun) O Mull, Thermal stability, Secchi disc transparencies, Nitrate variation, Phosphate variation, Carbon-14 productivity, Stephanodiscus niagarae Ehr, S Hantzschii Grun, Anabaena, Microcystis, Aphanizomenon.

The phytoplankton population dynamics, carbon-14 primary productivity and certain physicochemical properties of the shallow and highly eutrophic Lake Butte des Morts, Wisconsin was studied in 1966-69. Two co-dominant summer diatoms, Melosira granulata (Ehr.) Ralfs and M. ambigua (Grun.) O. Mull., widely recognized as indicators of eutrophy, were emphasized in the study. Periodicities of other planktonic members of the genus Melosira have been shown to be related primarily to water turbulence, and perennation is

due to survival as vegetative cells in the bottom sediments during periods of thermal stability. Lake Butte des Morts is a portion of the larger Winnebago pool and has an area of 37.79 square kilometers, a mean depth of 1.42 meters, and a theoretical retention time of only 2 to 14 days. The trophic state of the lake is comparable to western Lake Erie and the lake is presently undergoing a significant loss of aquatic macrophytes and turbidity is increasing. Thermal stability was found to be temporary during open water periods and occurred only during calm conditions. The water quality characteristics of the lake were evaluated in terms of water temperature, dissolved oxygen, Secchi disc transparencies, dissolved solids, nitrate, and phosphate variation during seasonal changes. Both Melosira ambigua and M. granulata were found alive in the bottom sediments to depths of 7 centimeters, while few other forms survived at any depth. Temperature is the dominant factor apparently regulating population growth rates of these two species and data from the study and from the literature were collected to characterize these species.
W71-09561

FALL CHINOOK SALMONS SPAWNING IN THE COLUMBIA RIVER NEAR HANFORD, 1947-1969,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
D. G. Watson.
Available from the National Technical Information Service as BNWL-1515, $3.00 in paper copy, $0.95 in microfiche. Betelle Northwest Laboratories report BNWL-1515, Oct 1970. 45 p.

Descriptors: *Thermal pollution, *Fish behavior, *Chinook salmon, *Ecosystems, Columbia river.
Identifiers: *Heated effluents, *Osteichthyes.

There was no evident relationship between the operation of the Hanford reactors and the numbers of fish spawning in the Hanford reach of the river. Recent increases in numbers of fall chinook spawners seemed more closely associated with the construction of dams downstream and immediately upstream from Hanford, and the probably displacement of fish from these areas. Water temperatures were less than 15LC during the peak of spawning, well within the upper tolerance limits for this species.
W71-09573

TEMPERATURE, TIMING, AND SEAWARD MIGRATION OF JUVENILE CHINOOK SALMON FROM THE CENTRAL COLUMBIA RIVER,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
C. D. Becker.
Available from the National Technical Information Service as BNWL-1472, $3.00 in paper copy, $0.95 in microfiche. Batelle Northwest Laboratories report BNWL-1472, Jul 1970. 21 p.

Descriptors: *Thermal pollution, *Fish behavior, *Chinook salmon, Columbia River.
Identifiers: *Hanford production reactors, *Heated effluents, *Osteichthyes.

A sizeable population of adult chinook salmon now spawns each fall in the free-flowing Hanford environs of the central Columbia River. This population has acquired significance because other vital spawning areas in the mainstem Columbia have been inundated by hydroelectric development. Studies conducted in 1969 show that the progeny of the Hanford population migrates seaward from April to July in the ancient pattern that correlates with favorable water temperatures and high discharge volumes. In contrast, the passage of juvenile chinooks that now issue from upriver reaches is known to be delayed until July and August when temperatures and dishcharge volumes are less favorable. Temperatures in the central Columbia are modified by discharges of heated effluent from plutonium production reactors at Hanford, in addition to largely seasonal changes in river flow, cooling or warming by the upriver reservoir complex, and summer heat input from the atmosphere. In 1968 and 1969, mean weekly water temperatures peaked in late July, August, and early September with maximum daily temperatures briefly reaching 19.1 and 19.7C, respctively, at Priest Rapids and 19.7 and 20.6C at Richland. The relationship of ambient temperatures and river discharges to the natural and delayed migration of juvenile chinooks through the Hanford area is evaluated. Maximum temperatures in the central Columbia seldom exceed 22C and have not been recorded as approaching 25.1C, the apparent upper incipient lethal limit for juvenile chinooks. Although peak summer temperatures (above 20C) may be suboptimum for the survival of young salmon, such conditions probably existed long before the advent of modern man. Present peak temperatures do not appear to be directly lethal even with increments of heat from reactor effluent. Potentially adverse thermal effects from reactor operation would most likely appear at subacute levels and resist casual detection. This assumes that a slight increase in excess of the annual temperature cycle does not greatly intensify other existing environmental hazards.
W71-09574

THE ROLE OF PRIMARY PRODUCTION IN SOLVING PROBLEMS OF HYDROBIOLOGICAL PROCESSES AND THE MEANS OF CONTROLLING THEM,
Naval Oceanographic Office, Washington, D.C.
V. I. Zhadin.
Available from the National Technical Information Service as AD-720 183, $3.00 in paper copy, $0.95 in microfiche. Naval Oceanographic Office Translation 199, 1963; trans-from: Pervichnaya Produkstsiya morey i vnutrennikn rod.

Descriptors: *Water pollution, *Plankton, *Fouling, Sanitary engineering.
Identifiers: Biological contamination, Hydraulic systems, USSR, *Primary biological productivity.

The paper discusses the effect of primary production and biological contamination of water basins, which causes pollution of water and fouling on vessels, water pipes and hydraulic structures. The problems arising from the phenomena and the measures aimed at lessening or eliminating their negative effect on national economy and sanitary conditions are singled out, indicating the need for special organizations and institutes that would contribute to the solution of the complex problems.
W71-09575

COMPREHENSIVE WATERSHED MANAGEMENT-THE ANADROMOUS FISHERY RESOURCE,
Contra Costa Coll., San Pablo, Calif. Dept. of Biology.
For primary bibliographic entry see Field 06G.
W71-09583

EFFECTS OF TURBIDITY ON FOREST RECREATION POTENTIALS,
Forest Service (USDA), Jackson, Miss.
For primary bibliographic entry see Field 05G.
W71-09631

PHYSIOLOGICAL ECOLOGY OF SELECTED POLYCHAETOUS ANNELIDS EXPOSED TO DIFFERENT TEMPERATURE, SALINITY AND DISSOLVED OXYGEN COMBINATIONS,
Maine Univ., Orono.
Thomas L. Richards.
Ph.D. Thesis, August 1969, 170 p, 42 fig, 21 tab, 176 ref. NSF Grant GB-4892 and Office of Water Resources Research Project No A-011 ME (2).

Descriptors: *Annelids, *Physiological ecology, *Water temperature, *Salinity, *Dissolved oxygen, *Biochemical oxygen demand, Worms, Environmental effects, Thermal pollution, Sea water, Salt tolerance, Stress, Effective stress, Invertebrates, Resistance.
Identifiers: *Polychaetes, Nereidae, Spionidae, Survival.

Survival of adult and larval polychaetes belonging to the families Nereidae and Spionidae in reduced dissolved oxygen concentrations was temperature and salinity dependent, and independent of the life history stages. Species adapted to estuarine conditions tolerate wide fluctuations in temperature, salinity and dissolved oxygen, while species found in open coast areas, where environmental changes are not so great, survived only moderate changes. Nereids and spionids would make good assay organisms. (Katz-Washington)
W71-09658

TEMPERATURE TOLERANCE OF YOUNG-OF-THE-YEAR CISCO, COREGONUS ARTEDII,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
Thomas A. Edsall, and Peter J. Colby.
Transactions of the American Fisheries Society, Vol 99, No 3, p 526-531, July 1970. 4 fig, 1 tab, 14 ref.

Descriptors: *Water temperature, *Lethal limit, *Physiological ecology, *Cold resistance, *Heat resistance, *Cisco, *Environmental effects, Bioassay, Temperature, Fish physiology, Aquatic environment, Water quality, Water pollution effects, Fish diseases, Great Lakes, Growth stages.
Identifiers: *Coregonid fishes, Coregonidae, Natural mortality.

Young-of-the-year ciscoes (Coregonus artedii) acclimated to 2,5,10, 20 and 25C and tested for tolerance to high and low temperatures provide the first detailed description of the thermal tolerance for coregonids in North America. The upper ultimate lethal temperature of the young ciscoes was 26C (6C higher than the maximum sustained temperature tolerated at adult ciscoes in nature) and the ultimate lower lethal temperature approached 0C (near that commonly tolerated in nature by adult ciscoes). The temperature of 26C is slightly higher than the lowest ultimate upper lethal temperature recorded for North America freshwater fishes; however, published information on the depth distributions of fishes in the Great Lakes suggests that some of the other coregonids may be less tolerant of high temperatures than the ciscoes. (LeGore-Washington)
W71-09659

THE TOXICITY OF THE HYDROLYSIS AND BREAKDOWN PRODUCTS OF MALATHION TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS, RAFINESQUE),
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
Michael E. Bender.
Water Research, Vol 3, p 571-582, 1969. 4 fig, 2 tab, 14 ref. USPHS grant no ES-00016-02.

Descriptors: *Toxicity, *Organophosphorous pesticides, *Lethal limit, *Pesticide kinetics, *Pesticide residues, *Pesticide toxicity, Bioassay, Control, Toxins, Hydrolysis, Hydrogen ion concentration.
Identifiers: *Malathion, *Breakdown products, *Synergism, TLm, Pimephales sp.

Malathion undergoes hydrolysis in aqueous solutions; the products derived from the reaction are dependent upon the pH of the medium. It was the purpose of this investigation to evaluate the toxicity of the products of malathion hydrolysis in the fathead minnow, Pimephales promelas. The studies were conducted by toxicity bioassays of 96 hr duration and continuous exposure tests of 14 day duration. The results of the experiments demonstrated the following: (1) the basic hydrolysis product, diethyl fumarate, was more toxic than malathion to the test species; (2) a pronounced synergistic effect

was demonstrated between malathion and its two basic hydrolysis products; and (3) continuous exposure decreased the TLm concentration of malathion and its basic hydrolysis products. (LeGore-Washington)
W71-09661

ECHINODERMS: AN AUTORADIOGRAPHIC STUDY OF ASSIMILATION OF DISSOLVED ORGANIC MOLECULES,
Newcastle-uon-Tyne Univ. (England). Dept. of Zoology; and Newcastle-upon-Tyne Univ. (England). Dove Marine Lab.
A. R. Fontaine, and Fu-Shiang Chia.
Science, Vol 161, p 1153-1155, Sept 13, 1968. 2 tab, 8 ref.

Descriptors: *Absorption, *Physiological ecology, *Animal physiology, *Metabolism, *Organic compounds, Penetration, Aquatic animals, Biochemistry, Analytical techniques.
Identifiers: *Assimilation, *Echinodermata, Autoradiography, Cucumaria sp., Amphipholis sp., Sea cucumber, Starfish.

Autoradiographic techniques were utilized to examine assimilation of dissolved organic molecules by a holothurian (Cucumaria lactea) and an ophiuroid (Amphipholis squamata). Animals were immersed in experimental solutions for 3 hr and sampled at 0, 1, 3 and 7 days post-exposure. Labelled glycine and glucose remaining in the autoradiographs was apparently incorporated into synthesized macromolecules. Cells differ in their competence to metabolize specific nutrients, an indication that there are speciallized cellular responses to exogenous organic molecules. Embryonic ophiuroid tissues have an exceptional capacity for assimilation. (LeGore-Washington)
W71-09662

ECOLOGICAL MANAGEMENT PROBLEMS CAUSED BY HEATED WASTE WATER DISCHARGE INTO THE AQUATIC ENVIRONMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
John Cairns, Jr.
Water Resources Bulletin, Vol 6, No 6, p 868-878, November-December 1970, 4 fig, 22 ref.

Descriptors: *Water pollution effects, *Water pollution sources, *Water pollution treatment, *Water pollution control, *Cooling water, *Heated water, *Water temperature, *Electric powerplants, Environmental effects, Water quality, Aquatic environment, Temperature, Aquatic populations, Physiological ecology, Technology, Nuclear powerplants, Thermal powerplants, Stress.
Identifiers: *Thermal pollution, Energy production, Energy utilization, Biological stress.

Discharge of heated waste water may affect entire aquatic ecosystems and, if the temperature change is large, may destroy the capacity of the ecosystem to serve a variety of beneficial purposes. However, it is possible to discharge heated waste water in carefully controlled amounts without seriously degrading the aquatic ecosystem. There are four basic alternatives open to us regarding heated waste water: (1) placing all heated waste water in streams, lakes and oceans without regard to the effects, thus considering the environmental damage a necessary consequence of our increased power demand; (2) using, but not abusing, existing ecosystems; (3) finding alternative ways to dissipate or beneficially use waste heat; and (4) modifying ecosystems to fit the new temperature conditions. We have reached a stage of development in which the ecological portion of our life-support system is endangered by the expanding industrial portion. Optimal function and full beneficial use of both portions will be possible only if a variety of disciplines and diverse points of view can cooperate. Since wastes in amounts that are acceptable taken one at a time may be lethal collectively, environmental management should be on a regional basis. (LeGore-Washington)
W71-09664

PESTICIDE RESIDUES IN FISH ARE STAGGERING, HOWEVER, DDT CAN BE REMOVED FROM FISH.

Environmental Science and Technology, Vol 3, No 7, p 613, July 1969.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide removal, Pesticide residues, Public health, Pesticide kinetics, Delaware River, Fish.
Identifiers: Fish flesh, Fish contamination, Cooking, Food preparation, Pesticide occurrence.

A two year monitoring program conducted by the Bureau of Sport Fisheries and Wildlife found chlorinated hydrocarbon residues in fish from 45 U.S. rivers and lakes. The highest DDT concentration, 45.27 ppm, was found in white perch from the Delaware River. Up to 55% of the DDT in fish flesh can be removed by deep frying, 36% by broiling, 25% by pan-frying and 11% by baking. (LeGore-Washington)
W71-09665

INORGANIC COMPOSITION OF GALLBLADDER BILE FROM FASTED RAINBOW TROUT,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
Joseph B. Hunn.
The Progressive Fish Culturist, Vol 31, No 4, p 221-222, October 1969. 1 tab, 9 ref.

Descriptors: *Fish physiology, *Ions, *Biochemistry, *Salts, Rainbow trout, Inorganic compounds, Calcium, Magnesium, Phosphorous, Sodium.
Identifiers: *Starved fish, Fasting, Starving, Salmo sp, Bile, Chloride.

Fasting fish are subject to an obligatory loss of salt by way of urine. These salts can be replaced by ion uptake across the gills and for a limited period from the intestine, but bile has been given little study as a source of intestinal salts. Rainbow trout (Salmo gairdneri) were fasted for 96 hr before samples were taken. Gallbladder bile from these fish contained concentrations of sodium, potassium, calcium and magnesium that exceeded those of the plasma. Concentrations of chloride and inorganic phosphate were less than those in the plasma. Bile may make significant contributions of Na, K, Ca and Mn to the intestinal tract, thereby influencing enzymatic activity and osmoregulation. (LeGore-Washington)
W71-09666

PESTICIDES IN WATER,
Federal Water Pollution Control Administration, Corvallis, Oregon. Pacific Northwest Water Lab.
For primary bibliographic entry see Field 05B.
W71-09667

OXIDATIVE METABOLISM OF ROTENONE IN MAMMALS, FISH, AND INSECTS AND ITS RELATION TO SELECTIVE TOXICITY,
Institute of Physical and Chemical Research, Tokyo (Japan). Lab. of Insect Toxicology.
Jun-Ichi Fukami, Takashi Shishido, Kazuo Fukunaga, and John E. Casida.
Agricultural and Food Chemistry, Vol 17, No 6, p 1217-1226, Nov-Dec 1969. 3 fig, 5 tab, 35 ref.

Descriptors: *Rotonone, *Toxicity, *Fish physiology, *Animal physiology, *Metabolism, Pesticides, Piscicides, Pathology, Inhibitors, Biochemistry, Respiration.
Identifiers: *Toxicity mechanism, *Mechanism of toxicity, *Selective toxicity, *Detoxification, *Liver function.

Rotenone inhibits the respiration of mitochondria by blocking the reduced nicotinamide adenine dinucleotide (NADH) - dehydrogenase segment of the respiratory chain. It appears that rotenone's selective toxicity, i.e. moderate toxicity to mammals vs. extreme toxicity to fish and insects, depends upon differences in the distribution pattern or in the detoxification rate of rotenone in various organisms. The results of described in vivo and in vitro studies on rotenone detoxification indicate that the effects of components in the soluble fraction of liver homogenates possible are related to the selective toxicity of rotenone to mammals, fish and insects. (LeGore-Washington)
W71-09668

EFFECT OF ETHANOL, BOURBON AND VARIOUS ETHANOL LEVELS ON Y-MAZE LEARNING IN THE GOLDFISH,
Boston City Hospital, Mass. Alcohol Study Unit; and Harvard Medical School, Boston, Mass.
Ralph S. Ryback.
Psychopharmacologia (Berl), Vol 14, p 305-314, 1969. 5 tab, 17 ref. National Inst of Mental Health Grant No 09245.

Descriptors: *Alcohols, *Fish physiology, *Fish behavior, Fish passages, Fish guiding, Toxicity, Inhibitors, Water pollution effects, Psychological aspects, Social behavior (Animals).
Identifiers: *Ethanol, *Goldfish, *Learning.

The effects of exposure of goldfish (15.20 cm long) to various concentrations (400 to 650 mg/100 ml) of ethanol were investigated relative to rate of learning and to retention of learning. Large amounts of ethanol generally interfere with performance. Subjects continuously exposed for 6 hrs 'adapted' to high ethanol levels. The reduction in the observed pharmacological effect of ethanol is due more to the prolonged presence of ethanol in the brain than to whether the level is rising or falling. There is a difference between the behavioral effect of ethanol, with a low congener content, and bourbon, with a high congener content. The goldfish is offered as a heuristic model for investigation of biological effects of ethanol. (LeGore-Washington)
W71-09669

STATE-DEPENDENT OR 'DISSOCIATED' LEARNING WITH ALCOHOL IN THE GOLDFISH,
Boston City Hospital, Mass. Alcohol Study Unit; and Harvard Medical School, Boston, Mass.
Ralph S. Ryback.
Quarterly Journal of Studies on Alcohol, Vol 30, No 3, p 598-608, September, 1969. 4 tab, 28 ref. National Inst of Mental Health Grant No MH-09245-01.

Descriptors: *Alcohols, *Fish physiology, *Fish behavior, Fish passages, Fish guiding, Toxicity, Inhibitors, Water pollution effects, Psychological aspects, Social behavior (Animal).
Identifiers: *Goldfish, Carassius auratus, Learning.

State-dependent learning with alcohol was investigated in 32 large goldfish, each trained in a Y-maze daily until a criterion of 18 out of 20 correct turns was obtained. On the next day the groups were either trained in an alcohol solution or in water, and were later tested in alcohol or in water. Results indicated that alcohol during training impaired learning, but that its effect during testing depended on its presence during training. In a second experiment, 4 groups of 6 fish were either trained in water or in an alcohol solution (400 mg per 100 ml) after being immersed in the alcohol for 2 hrs, and were tested 3 days later in water or in the same concentration of alcohol. An additional 6 fish were trained in alcohol after being in the alcohol for 6 hrs, and were tested 3 days later in water. The group taught in alcohol, but tested in water exhibited poor knowledge retention, but all other groups showed good retention. The results are discussed in relation to blackouts in alcoholics and learning under the influence of alcohol. (LeGore-Washington)
W71-09670

TOXICITY OF PESTICIDES WITH A HIGH CONTENT OF 4,6-DINITRO-O-CRESOL FOR FISH (In Czech),
Vyzkumny Ustav Rybarsky a Hydrobilogicky Vodnany, Prague (Czechoslovakia).
Z. Svobodova.
English summary. Buletin VUR Vodnany, Vol 6, p 20-25, 1970. 4 tab, 12 ref.

Descriptors: *Pesticides, *Toxicity, *Lethal limit, *Toxins, *Organic pesticides, *Agricultural chemicals, Bioassay, Physiological ecology, Fishkill, Mortality, Pesticide kinetics, Organic compounds, Pollutant identification, Water pollution effects, Runoff, Chemcontrol, Pesticide residues.
Identifiers: Cresol, LD-50, DNOK.

The toxicity to fish of newly developed pesticides containing 4,6-dinitro-o-cresol (DNOK) was investigated. The trade compounds were Nitrosan 50, Rafex 50, Zimni postrik I and Zimni postrik II (winter spray I and II). Toxicity depends upon percent DNOK content, upon the response of the pH noxious bath, and upon the nature of the remaining substances contained in the preparation. According to results, it is possible to arrange the preparations in order of decreasing toxicity: Zimni postrik II, Rafex 50, Nitrosan 50 and Zimni postrik I. Nevertheless, all the above must be considered noxious to fish. (LeGore-Washington)
W71-09671

TOXICITY OF PCP FOR THE 'DOJO' FISH, MISGURNUS ANGUILLICAUDATUS (CANTOR), WITH SPECIAL REFERENCE TO THE ESTIMATION OF SIZE FACTOR (In Japanese),
Ihara Agricultural Chemicals Inst., Shimizu (Japan).
Sumio Nagasawa, Shoji Asano, and Kazunobu Kondo.
English summary. Japanese Journal of Applied Entomology and Zoology, Vol 7, No 4, p 300-306, 1963. 1 fig, 2 tab, 7 ref.

Descriptors: *Bioassay, *Toxicity, *Lethal limit, *Weight, *Statistical methods, *Analytical techniques, *Phenols, *Fish physiology, Regression analysis, Poisons, Toxins, Laboratory tests, Testing, Water pollution effects, Environmental effects.
Identifiers: *Body weight, *Dose, Drugs, Correction factors, Multiple regression.

In many experiments relative to effects of drugs and poisons on animals differing in size but otherwise similar, the same dose is given to each individual as if its action were independent of body size. A size factor for equalizing individual differences in body weight can be determined experimentally for each drug by multiple regression. This approach was applied to the rate of effect of pentachlorophenol (PCP) on the 'Dojo' fish. After exposure of each fish to PCP, the lethal time was measured in minutes and the following regression was obtained: Y — -0.05834 .. 0.58337x1 - 0.16823x2, where: Y — log (100/minutes survival), x1 — log ppm of dose, and x2 & log grams of fish body weight. Lethal dose to body weight was not directly proportional. (LeGore-Washington)
W71-09672

SEXUAL DIFFERENCE IN HEAT RESISTANCE OF THE OZARK MINNOW, DIONDA NUBILA (FORBES),
Arkansas Univ., Fayetteville. Dept. of Zoology.
Claude D. Baker, William H. Neill, and Kirk Strawn.
Transactions of the American Fisheries Society, Vol 99, No 3, p 588-591, July 1970. 1 fig, 11 ref. NSF Grant No GY-322.

Descriptors: *Heat resistance, *Environmental effects, *Fish physiology, *Physiological ecology, *Lethal limit, *Water temperature, Bioassay, Acclimatization, Temperature, Sexual maturity, Gonads, Mortality, Fishkill, Fish diseases, Aquatic environment, Water quality, Fish reproduction, Resistance, Heated water, Thermal water.
Identifiers: Sex, Sex differences, Death point, End point.

The intraspecific variation in heat resistance in the Ozark minnow, Dionda nubila was studied. Fish were acclimated for 7 days and subjected to a stress of 36.5, 37.0 or 37.5C. Cessation of gill movement was considered the death point. In general, pooled sample median resistance times of males were less than half those of females tested at equivalent temperatures. Brightly colored males, i.e., those approaching spawning condition, were generally the first of a particular sample to die. The difference between male and female heat resistance could not be attributed to size. (LeGore-Washington)
W71-09673

EFFECT OF M.S. 222 ON NITROGEN EXCRETION OF THE BLUEGILL (LEPOMIS MACROCHIRUS),
Loyola Univ., Chicago, Ill. Dept. of Biology.
Jan Savitz.
The Journal of the Elisha Mitchell Scientific Society, Vol 85, No 4, p 150-151, Winter 1969. 1 tab, 10 ref. US Dept of Interior, Graduate Educational Grant No 14-17-007-403 (G).

Descriptors: *Water pollution effects, *Fish physiology, *Nitrogen, Bioassay, Chemical wastes, Environmental effects, Fish toxins.
Identifiers: *MS 222, *Anesthetics, *Fish anesthetics, *Excretion, Drugs, Drug effects, Biochemical wastes.

Because M.S. 222 (tricaine methanesulphonate) anesthetizes fish, it was also expected to lower their nitrogen excretion rate. Static bioassays were used, with pre- and post-treatment water samples being analyzed for nitrogen content. The nitrogen excretion rates for bluegills treated with 0.003% M.S. 222 for one day were not significantly different from those of untreated controls. (LeGore-Washington)
W71-09675

PRELIMINARY REPORT ON THE BENTHIC FAUNA OF THE RIVER TESHIO (In Japanese),
For primary bibliographic entry see Field 05B.
W71-09676

THE 1967 SHARK KILL IN SAN FRANCISCO BAY,
East Bay Regional Park District, Oakland, Calif.; and California Academy of Sciences, San Francisco, Calif. Steinhart Aquarium.
Ronald A. Russo, and Earl S. Herald.
California Fish and Game, Vol 54, No 3, p 215-216, 1968.

Descriptors: *Water pollution effects, *Fishkill, *Mortality, *Elasmobranches, *Sharks, Water pollution sources, Fish behavior, Bottom fish, Physiological ecology, Environmental effects, Fish conservation, Fish diseases.
Identifiers: *Stingrays, *Rays, San Francisco Bay, Triakis sp, Rhinotriacis sp, Notorynchus sp, Myliobatis sp.

During July and August, 1967, more than 725 elasmobranchs of four species (Triakis semifasciata, Rhinotriacis henlei, Notorynchus maculatus and Myliobatis californicus) were collected from a fishkill in the Alameda Beach area of San Francisco Bay. Of interest was the aberrant behavior of the shark, R. henlei, which often and repeatedly beached themselves. All four species are bottom dwelling elasmobranchs, as opposed to fast-swimming elasmobranch species. The responsible pollutant, therefore, must have been something which spread over the bottom of the bay for a considerable area and which had a breakdown period of greater than two months. The source of the contamination was not located. (LeGore-Washington)
W71-09677

TOXICITY AND TREATMENT OF DE-INKING WASTES CONTAINING DETERGENTS,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
D. W. Martens, R. W. Gordon, and J. A. Servizi.
International Pacific Salmon Fisheries Commission, Progress Report No 25, 1971. 24 p, 2 fig, 8 tab, 15 ref.

Descriptors: *Water pollution effects, *Detergents, *Chemical wastes, *Water pollution sources, *Water pollution treatment, *Salmon, *Fish physiology, *Oxygen demand, *Biochemical oxygen demand, *Toxicity, *Waste treatment, Cleaning, Pink salmon, Sockeye salmon, Industrial wastes, Waste water treatment, Lethal limit, Pulp wastes.
Identifiers: *Paper processing, *Detoxification, Fraser River, De-inking wastes, Nalco 808, Sterox MJ-b.

Some lethal and sublethal effects on juvenile sockeye (Oncorhynchus nerka) and pink salmon (O. gorbuscha) of proposed de-inking wastes and their contained detergents were investigated. Toxicity was attributed primarily to the waste's content of nonionic detergents, Nalco 808 and Sterox MJ-b, which caused lethary, excessive mucous secretion on gills and depressed oxygen consumption at concentrations less than the lethal level. The biochemical oxygen demand (BOD) of de-inking wastes was easily reduced by biological treatment, but the wastes were generally not readily detoxified owing to resistance of the detergents to degradation. Detergents were removed from solution by activated carbon, but this method of treatment would be impractical. The alternatives for treatment of the proposed wastes appeared to be selection of detergents which would be readily detoxified during biological treatment, or selection of a method capable of removing the detergents. (LeGore-Washington)
W71-09678

II. SUBLETHAL EFFECTS AND CHANGES IN ECOSYSTEMS: ASSESSMENT OF THE EFFECTS OF POLLUTANTS ON PHYSIOLOGY AND BEHAVIOUR,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
J. M. Anderson.
Proceedings of the Royal Society of London B, Vol 177, p 307-320, 1971. 11 fig, 1 tab, 21 ref.

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Water pollution effects, *Acclimatization, *Salmonids, *Fish physiology, *Water temperature, *Lethal limit, *Inorganic compounds, *Physiological ecology, *Environmental effects, Salmon, Trout, Temperature, Pesticides, Potassium compounds, Water quality.
Identifiers: *Chronic pollution, *Dinitrophenol, *Potassium cyanide, Salvelinus sp, Salmo sp.

The effects were studied of chronic pollution upon salmonid fishes. It is noted that exposure to DDT influences temperature selection and acclimation by salmon (Salmo salar) and brook trout (Salvelinus fontinalis). Low doses lower, and high doses raise the preferred temperature. Likewise, DDT raises the lower lethal temperature of fish, although it has no apparent effect on the upper lethal temperature. Effects of potassium cyanide and dinitrophenol upon temperature preference are also discussed, as are the effects of DDT upon learning and the biological effects of heavy metals. Ecological implications of these observations are discussed. (LeGore-Washington)
W71-09679

MASS MORTALITY OF THE CREVALLE JACK, CARANX HIPPOS (LINNAEUS) ON THE ATLANTIC COAST OF MASSACHUSETTS,
Southeastern Massachusetts Univ., North Dartmouth.
James G. Hoff.
Chesapeake Science, Vol 12, No 1, p 49, March 1971. 1 fig, 4 ref.

Descriptors: *Fishkill, *Mortality, *Water temperature, *Cold springs, *Migration, *Fish physiology, *Environmental effects, *Cold re-

sistance, Temperature, Spring waters, Running waters, Fish diseases, Aquatic environment, Ecology, Physiological ecology, Saline water fish, Water pollution effects.
Identifiers: *Estuarine fish, *Caranx sp., Jack crevalle, Crevalle jack, Natural pollution.

A hydrographic and biological survey was conducted in the Slocum River, Massachusetts for over two years prior to October 18, 1969. On this date, over 200 dead juvenile jack crevalle (Caranx hippos) were found, although the mortality is estimated to have been greater. Death was reasoned to have been caused by low water temperature (7.4 - 9.0C). Other species were apparently unaffected. (LeGore-Washington)
W71-09680

AVOIDANCE OF ANOXIC CONDITIONS BY THE SAND SHRIMP, CRANGON SEPTEMSPINOSA SAY,
Maine Univ., Orono.
Paul A. Haefner, Jr.
Chesapeake Science, Vol 12, No 1, p 50-51, March 1971. 1 fig, 1 tab, 5 ref. NSF Grant GB-6856.

Descriptors: *Dissolved oxygen, *Animal physiology, *Physiological ecology, Oxygen sag, Bioassay, Shrimp, Bioindicators, Environmental effects.
Identifiers: *Anoxia, *Hypoxia, *Avoidance, *Detection, *Sensory detection, Sand shrimp, Crangon sp.

The sand shrimp, Crangon septemspinosa, can detect and does avoid hypoxic and anoxic environmental conditions. Tests were carried out in a preference chamber at 5C and at 15 ppt salinity. Nitrogen gas was bubbled through water to create the hypoxic condition. The survival value of the demonstrated behavior becomes obvious when one considers that this species is often subjected to localized hypoxic stress in its estuarine environment. (LeGore-Washington)
W71-09682

WATER QUALITY CRITERIA FOR EUROPEAN FRESHWATER FISH. REPORT ON EXTREME PH VALUES AND INLAND FISHERIES,
Food and Agriculture Organization of the United Nations, Rome (Italy). European Inland Fisheries Advisory Commission.
R. Lloyd.
European Inland Fisheries Advisory Commission Technical Paper No 4, 1968. 24 p, 1 tab, 75 ref.

Descriptors: *Water pollution effects, *Lethal limit, *Hydrogen ion concentration, *Acidity, *Alkalinity, *Freshwater fish, *Fish behavior, *Aquatic environment, *Reviews, Impaired water quality, Resistance, Acidic water, Fishkill, Mortality, Pollutants, Water properties, Acid streams, Fish, Fish diseases, Fish physiology, Physiological ecology.
Identifiers: *Avoidance, Toxic mechanism, Mechanisms, Physiology.

A normal range of pH values is known to support good fisheries. A critical review is presented of published and unpublished data on direct and indirect effects of extreme pH on fish. There is no definitively established pH range within which a fishery remains unharmed and outside which it is damaged, but there is a gradual deterioration of the fishery as the pH values are further removed from the normal range. A pH range of 5-9 is not directly lethal to fish, but the toxicity of several common pollutants is markedly affected by pH changes within this range. Below pH 5.0, fish mortalities may be expected, and the productivity of a fishery is reduced. Some species may be acclimated to values as low as 3.7. Data on high pH are not extensive and probably reflect the lesser importance of this aspect. pH values between 9 and 10 may be harmful to a few species of fish, and higher levels are lethal to many more. It is observed that fish avoid zones of extreme pH value. (Katz-Washington)
W71-09683

MINERALIZATION OF ORGANIC PHOSPHORUS IN OLIGOTROPHIC LAKE SEDIMENTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Dwight A. Webster, and Carl L. Schofield.
Available from the National Technical Information Service as PB-201 002, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 29, April 1971, 25 p, 7 fig, 6 tab, 15 ref. OWRR Project A-026-NY (1).

Descriptors: Lakes, *Oligotrophy, Lake soils, Limnology, *Sediments, *Phosphorus, Compounds, Organophosphorus, Compounds, Aquatic plants, *Nutrient requirements, Fersility, *Soil chemistry, Benthic flora, Enzymes, Water pollution effects.

An investigation of the amount, forms, lability, and significance of the sediment organic phosphorus pool was conducted in two small, oligotrophic lakes in the Adirondack Mountain region of New York State. The lakes differed markedly in productivity, but similar morphometric features (low mean depth and low ratio of water volume/ sediment area) enabled the sediments to play significant, but contrasting roles in the metabolism of the lakes. In the unproductive lake, the sediments behaved mainly as a sink for phosphorus. Benthic plants in this lake showed evidence of phosphate limitation (low content of 'stored' phosphate and high phosphatase activity), resulting from low sediment phosphate availability. Rates of organic phosphorus mineralization were low and partly inhibited by low substrate availability. The low lability of both inorganic and organic phosphates was atributed to the high retention capacity of an iron dominated retaining phase in the sediments. Sediments in the productive lake were considered to constitute a considerable reservoir of available phosphate. The benthic community was well developed and nutritional assay of the plants indicated that they were well supplied with phosphate. The sediments in this lake were dominantly autochthonous, low in Fe and Al, and had a low phosphate retention capacity. Substrate availability was greater, as were hydrolysis rates of organic phosphorus. Mineralized phosphate was more readily available, primarily because the inorganic phosphate retaining phase was near saturation, thus resulting in the formation of a pool of highly labile surface phosphate.
W71-09738

ROLE OF EXCRETED CHLORTETRACYCLINE IN MODIFYING THE DECOMPOSITION PROCESS IN FEEDLOT WASTE,
Colorado State Univ., Ft. Collins. Dept. of Microbiology.
G. Keith Elmund, S. M. Morrison, D. W. Grant, and M. P. Nevins, Sr.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 2, 1971, p 129-131.

Descriptors: *Farm wastes, Biodegradation, *Biochemical oxygen demand, Bactericides, Toxicity, *Stabilization, Bioassay, Biological treatment, Diets, Water pollution effects, Feeds, Cattle, Ruminants, Pollutant identification.
Identifiers: Feedlot wastes, Dietary antibiotic, Rumen microflora, *Chlortetracycline.

Quantitative bioassays of fresh feedlot manure revealed that approximately 75 percent of the dietary chlortetracycline was excreted. The antibiotic concentration was 14 microgram g/gm of fresh feedlot manure, and 0.34 microgram g/gm of aged feedlot manure. Standard BOD5 values on manure from control steers and manures from steers receiving dietary chlortetracycline demonstrated that antibiotic supplementation of animal feeds may alter the microflora participating in the stabilization of feedlot manure. The effect of ingested chlortetracycline is two fold: (1) ingested antibiotic selects for a microbial population relatively inefficient in the stabilization process and (2) antibiotic supplementation apparently alters the digestive processes in the animal, resulting in manures which are less biodegradable as measured by the standard BOD5 procedure. (Christenburg-Iowa State)
W71-09749

POLLUTION, PESTICIDES AND THE PEOPLE -- AGRICULTURE AND OUR NATURAL ENVIRONMENT.
Greater Des Moines Chamber of Commerce, Iowa. Agricultural Dept.

33rd Annual (Forum), National Farm Institute, February 11-12, 1971, Des Moines, Iowa, 107 p.

Descriptors: *Farm wastes, *Pesticides, *Sediment, *Water pollution effects, Fertilizers, Economics, Legislation, Water pollution control, Benefits, Costs, Agriculture standards, Water quality, Taxes, DDT, Population, Livestock, Environment, Sewage.
Identifiers: Conservancy districts.

The proceedings of the National Farm Institute include papers concerned with the various aspects of pollution and today's environment. Various pollutants which are discussed include farm wastes, fertilizers, pesticides, and sediment. In addition, other papers report on population aspects, legislation, economics of pollution control, and interest groups concerned with pollution. A wide array of views and potential control systems are examined. (See also W71-09753 thru W71-09764) (White-Iowa State)
W71-09752

WHAT DO WE MEAN BY POLLUTION,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05A.
W71-09753

THE SPORTSMAN'S VIEW,
National Wildlife Federation.
Phillip Douglas.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 15-22.

Descriptors: *Pesticides, *DDT, Water pollution effects, Conservation, Biodegradation, Recreation, Diseases, Beneficial use, Toxicity, Solubility, Fish, Birds, Biocontrol, Cultural control.
Identifiers: *Biological concentration, Primary effects, Secondary effects.

Both sides of the pesticide problem are presented in this paper. Pesticides, and in particular DDT, have been used successfully to help control typhus fever, malaria, and dutch elm disease among others. These beneficial effects are sometimes offset by their harmful residues. The DDT molecule combines four properties that are responsible for its behavior in the environment: (1) toxicity to almost all animal life; (2) persistence; (3) mobility; and (4) solubility properties. Many examples of fish and bird fatality are pointed out as the result of the accumulation of DDT. Ususally these are the higher animals in carnivorous food chains. Twelve steps or courses of action are recommended to help alleviate the problem. (See also W71-09752) (White-Iowa State)
W71-09754

THE CITIZENS' VIEW OF POLLUTION,
League of Women Voters of the United States, Washington, D.C. Environmental Quality Program.
Donald Clusen, Mrs.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 7-13.

Descriptors: *Environment, *Water pollution effects, Pollution abatement, Legislation, Governments, Research and development, Water quality, Standards, Water Quality Act, Taxes, Agriculture.

The author attempts to give societies view of pollution while admitting that the role of spokesman is a dangerous one. Trying to describe pollution or

what it is constitutes a problem as varied as trying to prescribe solutions. There is no national consensus on environmental questions unless it is that a problem exists and the time to deal with it is now. An aroused public must insist that more be done, and faster, to abate pollution. Equally important is the preparation of a number of alternatives. Water resource development must be viewed as an integral part of the national effort to protect and improve the quality of man's environment. The general public has demonstrated that they want their money spent for pollution abatement. People want to have a voice in the choices to be made, they want to see some progress made, and they want environmental concerns to have a higher priority - in government, business and agriculture. (See also W71-09752) (White-Iowa State)
W71-09755

THE FARMERS' CONCERN,
Gilbert Stanek.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 23-29.

Descriptors: *Wastes, *Water pollution effects, Dieldrin, DDT, Mercury, Pesticides, Insecticides, Herbicides, Resistance, Research and development, Education, Regulation.
Identifiers: *Panic power, Mis-use, Tolerance level.

Farmers have four areas of concern in the environmental pollution field. The first is 'panic power' created by news media and other sources that cry out in unsure, uninformed voices about the uncertainties of pollution. The second area is mis-use or the improper handling of wastes and pesticides by farmers as well as non-farmers. The third area deals with tolerance levels. What criteria should be used and what levels should be set are questions which remain largely unanswered. The fourth area of concern to farmers is that they are a minority group. We are warned that if the American farmers' efficiency of production is jeopardized by banning of pesticide usage, the consumer will suffer through increased food prices because of reduced production. Research, education and regulation are key steps to preserve our standard of living. (See also W71-09752) (White-Iowa State)
W71-09756

POPULATION GROWTH RATE SHOULDN'T GET ALL THE BLAME,
Bureau of the Census, Washington, D.C.
Conrad Taeuber.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 31-39.

Descriptors: *Human population, *Growth rates, Fertility, Fecundity, Census, Cities, Water pollution effects, Natural resources.

Population growth characteristics of the United States are pointed out. The growth rate is traced from pre-war times to present, with projections being made for future growth. Pollution and other social ills are not primarily a result of our rate of population growth. Changing standards and habits, in activities, technology, and the style of life have much more to do with the accumulation and disposition of waste materials and pollutants than does the number of persons involved. (See also W71-09752) (White-Iowa State)
W71-09757

PESTICIDES,
Environmental Protection Agency, Washington, D.C. Pesticide Advisory Committee,
William M. Upholt.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa p 49-56.

Descriptors: *Pesticides, *DDT, Diseases, Insecticides, Public health, Toxicity, Pesticide residue, Hazards, Poisons, Beneficial use, Water pollution effects.
Identifiers: *Parathion, Malaria, Cancer.

Pesticides are discussed with three main areas of emphasis. DDT is used as an example, but the principles are intended to apply to pesticides generally. The first area of emphasis is of the beneficial use of DDT. Increased production and the control of malaria are two main benefits. Human health hazards from pesticides are next pointed out. Death and illness have been attributed to pesticide poisoning. Currently the human health hazard that is most controversial is the possibility of cancer or birth defects from exposure to pesticide concentrations. Environmental hazards are the last area of concern. Biological accumulation and persistence in the environment are two main problems. The author suggest a drastic reduction in the use of DDT as one solution. Pesticides are useful, but they all carry some risk of damage to man or the environment. (See also W71-09752) (White-Iowa State)
W71-09758

LIVESTOCK WASTE,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-09759

SEDIMENT: EVERYBODY'S POLLUTION PROBLEM,
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-09760

ECONOMICS OF POLLUTION CONTROL,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W71-09761

CURRENT CONSERVANCY LEGISLATION,
Iowa House of Representatives, Des Moines.
For primary bibliographic entry see Field 05G.
W71-09762

POLLUTION CONTROL DECISIONS - WHO SHOULD MAKE THEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09763

AGRICULTURAL BENEFITS FROM URBAN POLLUTION CONTROL,
Office of the Secretary of the Army, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-09764

SPECIFIC COMPOSITION OF PHYTOPLANKTON IN A LAKE WARMED UP BY WASTEWATER FROM A THERMAL POWER STATION AND IN LAKES WITH NORMAL TEMPERATURES,
Instytut Rybactwa Srodladowego, Olsztyn-Kortowo (Poland).
J. Poltoracka.
Translation from Polish AEC-tr-7194. Acta Societatis Botanicorum Poloniae, Polish, Vol. 37, No. 2, 1968, p. 297-325, 5 fig., 1 tab., 5 ref.

Descriptors: *Thermal powerplants, *Lakes, Temperature, Phytoplankton, Algae, Heated water, Population, Water pollution effects.
Identifiers: Species, Taxons.

A preliminary evaluation of the specific composition of phytoplankton was carried out in Lakes Lichen, Mikorzyn and Slesin, characterized by different temperatures caused by the activity of the powerplant at Konin. The highest water temperatures were displayed by Lake Lichen (7.4-27.5C), and the lowest temperatures prevailed in Lake Slesin (0.8-20.7C). During the entire period of investigation in all three lakes, 305 species were found and 414 taxons were identified. Predominant among them were Bacillariophyceae (44 percent), chlorophyceae (34 percent) and cynonphyceae (11 percent). The highest number of phytoplankton components (285) were found in Lake Lichen, and their lowest number (197) was ascertained in Lake Slesin, which was associated with great differences in the share of chlorophyceae whose highest number was found in the warmest, Lake Lichen, whereas their lowest number was discovered in Lake Slesin, the coldest lake. The number of species of algae in Lake Lichen was rather stable throughout the year but fluctuated seasonally in other lakes. A most marked correlation between the number of the taxons of algae and surface water temperature was observed in Lake Lichen. With respect to the size of individual population, 14 planktonic species were dominant at various periods in different lakes. (Upadhyaya-Vanderbilt)
W71-09767

ELECTRIC POWER GENERATION AND THE ENVIRONMENT,
Westinghouse Electric Corp., Pittsburgh, Pa. Environmental Systems Dept.
James H. Wright.
Westinghouse Engineer, Vol. 30, No. 3, May, 1970, p. 66-80, 8 fig., 7 tab., 9 ref.

Descriptors: *Thermal pollution, *Environment, *Thermal powerplants, *Radiation, *Standards, *Temperature, Background radiation, Tritium, Water pollution effects.
Identifiers: Air pollutants, Krypton, Discharged heat, Heat dissipation, Exposure, Pressurized water reactors, Fossil fuels.

In this review, effects of steam electric generating stations, their emissions and resulting effects of those emissions on local and global environments have been briefly discussed. The United States, with 6 percent of the world's population, consumes 35 percent of the fossil fuels available and produces more than its share of pollution. Typical background exposures result in radiation doses to local residents in the range of 100 to 200 millirem per year. However, much larger exposures have been observed in certain locations such as in Kerala, India (1300 millirem per year) and granite areas of France (265 millirem per year). A brief history of establishment of radiation standards and a summary of Federal Radiation Council standards is given. Radiation from reactor effluents has been studied for exposure to the general population following typical releases and exposure at site boundary during normal plant operation. Results of the calculation of radiation releases from a 1000 MWe pressurized water reactor plant is given. Long term build-up of radioisotopes in the biosphere, carbon monoxide, oxides of nitrogen and sulfur, particulates and hydrocarbons emissions are also discussed. Federal Water Quality criteria for temperature, methods of heat dissipation and heat release on a planetary scale is discussed briefly. (Upadhyaya-Vanderbilt)
W71-09768

MERCURY POLLUTION: INTEREST IN IT NOW ON THE UPSWING,
Industrial Pollution Control, Inc., Westport, Conn.
T. W. Lesperance.
Water and Wastes Engineering, January, 1971, p. A13-16.

Descriptors: *Heavy metals, *Chemical wastes, Water pollution sources, Poisons, Water pollution effects, Standards, Industrial wastes, Waste water treatment, Fish, Toxicity, Human pathology, Public health.
Identifiers: *Mercury.

Since industries became aware of the danger of mercury pollution, mercury consumption has dropped 11% in the last two years. The industries have started reclaiming and recycling large quantities of mercury that were formerly wasted. A standard of 0.005 mg/l of mercury in drinking water has

been proposed. Mercuric chloride at .0001 molar concentration was shown to inhibit several biological processes to values less than 5% of the original rate. The main effect on man is to the central nervous system. The best method of the detection of mercury is the colorimetric determination with dithizone. A list of possible industrial sources of mercury pollution is discussed. Among the possible treatment methods condensation precipitation, reverse osmosis and dialysis, lime treatment, etc., are mentioned. (Novotny-Vanderbilt)
W71-09774

MERCURY IN MAN,
Washington Univ., Seattle. School of Medicine.
Neville Grant.
Environment, Vol. 13, No. 4, p. 2-15, May, 1971, 8 fig., 29 ref.

Descriptors: *Heavy metals, *Poisons, *Toxicity, Food chains, Path of pollutants, Environmental effects, *Human diseases, *Public health, Fish, Foods, Fungicides, Agricultural chemicals, Standards, Air pollution, Water pollution effects, Circulation, Chromosomes.
Identifiers: *Mercury, Acceptable daily intake, *Methyl mercury, Human body, Brain, Tissue, Fetal damage, Half-life.

A series of alarming mercury contamination events is presented including the recent finding of 36 ppm of mercury in some health food tablets, made from compressed seal liver. Pathways of mercury in the system are illustrated, the cycle beginning with industry burning natural fuels. These emissions in the USA contribute some 275-1800 tons of mercury being released to the air annually. Mercury reaches man through food, particularly fish. Agricultural products are also of importance because of mercurial fungicides being freely used. Effects of various forms of mercury on man are depicted, levels of exposure are discussed, relation of methyl mercury levels in blood to physical hazard and specific areas of concentration in the human body are demonstrated. The relationship between methyl mercury intake and levels of methyl in brain tissue has been calculated. (Oleszkiewicz-Vanderbilt)
W71-09778

THERMAL POLLUTION FISHKILL.

American Association of Professors in Sanitary Engineering Newsletter, Vol. 6, No. 3, p. 15, April, 1971 (taken from Sports Fishing Institute Bulletin).

Descriptors: *Fishkill, *Thermal powerplants, *Temperature, *Thermal pollution, *Leakage, Bioassay, Acclimatization, Water pullution effects.
Identifiers: *Susquehanna River, Pennsylvania Power and Light, Rapid temperature drop.

A 720-MW generation unit at a thermal power plant on the Susquehanna River developed a water leak on February 4, 1971, and had to be shut down. This resulted in a sudden drop of water temperature which caused an estimated fishkill of 15,388 fish of value. A sudden 44F temperature drop-to 36F-caused the kill. This was clearly a thermal-pollution caused fishkill because the fish accumulated below the plant in the vicinity of warm water influence and died of exposure to the cold when the artificial heat had been cut off. The note also mentions thermal pollution studies on rapid water temperature changes, conducted at Vanderbilt University which demonstrates the extremely slow rates of temperature decrease which may still prove fatal to fish. (Oleszkiewicz-Vanderbilt)
W71-09781

DOW SUED BY ONTARIO FOR POLLUTION DAMAGE.

Chemical Week, Vol. 108, No. 12, p. 12, March 24, 1971.

Descriptors: *Heavy metals, Water pollution control, *Jurisdiction, *Lake Erie, Standards, Chlorine, Water pollution effects.
Identifiers: *Mercury, Dow Chemical of Canada, Ontario, *St. Clair River, *Detroit River.

The Ontario government's $25 million mercury pollution suit against Dow Chemical of Canada may set a precedent in instances where industry allegedly despoils the environment. In addition, the suit asks that Dow render harmless the mercury sediments on the bottom of St. Clair and Detroit Rivers, Lake St. Clair and Lake Erie or pay the province an additional $10 million for dredging the bottom. The new Federal Department of Environment for Renewable Resources said that it will require for all plants a maximum discharge of 0.005 lb. mercury/ton of chlorine by September 1, 1971, and by the end of the year limitation to the natural background. It is reported that Dow has reduced its release to 0.0009 lb. of mercury/ton chlorine. (Oleszkiewicz-Vanderbilt)
W71-09784

EFFECTS OF PULP MILL EFFLUENT ON WATER QUALITY AND BIOTA TRACE ELEMENT CHARACTERISTICS,
Bedford Inst., Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
J. M. Bewers, and G. J. Pearson.
Atlantic Oceanographic Laboratory Report 1970-8, November 1970, 57 p, 5 fig, 14 tab, 11 ref. AOL Report 1970-8.

Descriptors: *Water pollution effects, *Pollutant identification, *Pulp and paper industry, *Pulp wastes, *Water quality, *Biota, *Trace elements, Suspended load, Sediments, Solid wastes.
Identifiers: Transparency.

An attempt to obtain representative histograms of the chemical environment by employing neutron activation analysis to determine naturally occurring elements at fairly low levels was made in 1965 in a 400 acre tidal lagoon in Pictou County, Boat Harbor, Nova Scotia. This area is a treatment facility for wastes from the Scott Maritimes Bleached Kraft Pulp Mill. Four types of filter-feeding organisms were studied in this area of high concentrations of suspended solids and large quantities of unnatural chemical species. The chemical composition of the biota and suspended solids and the distribution of the suspended solids were studied to reflect the chemistry of the habitat. (Ensign-PAI)
W71-09793

LAMINARIA SACCHARINA AND MARINE POLLUTION IN NORTH-EAST ENGLAND,
Liverpool Univ. (England). Dept. of Botany.
E. M. Burrows, and C. Pybus.
Marine Pollution Bulletin, Vol. 2, No. 4, p 53-56, April 1971.

Descriptors: *Pollutant identification, *Bioindicators, *Algae, Growth rates, Cultures, Suspended load, Sewage, Industrial wastes, Silts, Water pollution effects.
Identifiers: *England, *Laminaria saccharina.

The growth rate of Laminaria saccharina in both the laboratory and in the field has been studied as an indicator for the effects of pollution on the north-east coast of England. This species provides a constant substrate for other marine organisms over a large area of the coast making it an important component of the coastal ecosystem. Laminaria saccharina is very sensitive to its environment and therefore is capable of giving a graded response to different types and degrees of pollution. The factor thought to inhibit growth most was the presence of silt; however pollution of the waters themselves having deleterious effects on growth cannot be ruled out. (Ensign-PAI)
W71-09795

MERCURY IN THE ADRIATIC,
Tokyo Univ. (Japan). Dept. of Urban Engineering and Kobe, Univ. (Japan). Dept. of Public Health.
Jun Ui, and Shoji Kitamara.
Marine Pollution Bulletin, Vol. 2, No. 4, p 56-58 April 1971.

Descriptors: *Water pollution, *Heavy metals, *Fish, *Food chains, *Human diseases, Public health, Toxicity, Environmental effects, Water pollution effects.
Identifiers: *Mercury, *Adriatic Sea, Minamata disease, Genetical change, Japan, Sweden, Italy.

Environmental pollution bo organic mercury compounds in the Adriatic is reviewed. Methyl mercury compounds accumulated in the biosphere in natural food chains have led to causing diseases in humans. These diseases and the sources of mercury pollutants causing these diseases in Japan, Sweden and Italy are discussed. (Ensign-PAI)
W71-09796

EFFECT OF CRUDE OIL AND AN OIL-SPILL DISPERSANT ON REEF CORALS,
Bellairs Research Inst., St. James (Barbados).
John B. Lewis.
Marine Pollution Bulletin, Volume 2, No. 4, p 59-62 April 1971.

Descriptors: *Oil wastes, *Emulsions, *Industrial wastes, *Coral, *Marine animals, Reefs, Detergents, Water pollution effects.
Identifiers: Caribbean, Barbados Coast, Porties porites, Agaricia agaricites, Fivia fragum, Madracis asperula.

Four species of corals from the reefs on the west coasts of Barbados were tested in laboratory experiments for the effects of crude oil and oil-spill detergents. All four species were found to be sensitive to pollution by both crude oil and the oil-spill dispersants. All were more affected by the dispersant than by the crude oil. Both pollutants had a harmful effect upon corals at concentrations of 100 to 500 ppm and recovery after 24 hr. exposure was not complete at these concentrations. (Ensign-PAI)
W71-09797

STUDIES OF ESTUARINE DEPENDENCE OF ATLANTIC COASTAL FISHES,
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Marine Lab.
John Clark, W. G. Smith, Arthur W. Kendall, Jr., and Michael P. Fahay.
Bureau of Sport Fisheries and Wildlife. Technical Papers, No. 28, August 1969, 132 p, 70 fig, 3 tab, 13 ref.

Descriptors: *Estuaries, *Coasts, *Atlantic Ocean, *Fishes, Migration, Coastal engineering, Pollutants, Data collections, Temperature, Salinity, Zooplankton, Trawling, Water pollution effects.

The extent that migratory fishes of the Atlantic coast depend on estuaries as essential habitat during the early stages of their lives and the effects on fishes from physical disruption and pollution of estuaries caused by twenty years of coastal development was studied by the Sandy Hook Marine Laboratory. The basic data from a series of surveys, eight cruises of the research vessel Dolphin, from Cape Cod, Massachusetts to Cape Lookout, North Carolina during a one year period from December 65 to December 66 is reported. The data includes temperatures, salinities, zooplankton volumes, and the midwater trawl collections of fishes. (Ensign-PAI)
W71-09800

RUNOFF OF DEICING SALT: EFFECT ON IRONDEQUOIT BAY, ROCHESTER, NEW YORK,
Rochester Univ., New York. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05B.

W71-09803

SUPPLEMENTAL IRRIGATION WITH STREAM WATER CONTAMINATED BY ACID MINE DRAINAGE,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 03C.
W71-09816

CONVOLUTION APPROACH TO THE SOLUTION FOR THE DISSOLVED OXYGEN BALANCE EQUATION IN A STREAM,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W71-09820

UNSOLVED PROBLEMS OF AQUATIC RADIOECOLOGY,
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05B.
W71-09847

RADIOECOLOGICAL INVESTIGATION IN THE REGION OF MURUROA ATOLL (TUAMOTU ISLAND),
Institute of the Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 05A.
W71-09848

NATURAL AND ARTIFICIAL RADIONUCLIDES IN SEAFOODS AND MARINE PROTEIN CONCENTRATES,
Oregon State Univ., Convallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W71-09849

UPTAKE OF RADIOACTIVE NUCLIDES BY AQUATIC ORGANISMS: THE APPLICATION OF THE EXPONENTIAL MODEL,
Tokyo Univ. (Japan). Dept. of Fisheries.
Y. Hiyama, and M. Shimizu.
Environmental Contamination by Radioactive Materials, Vienna, International Atomic Energy (1969), p 463-476.

Descriptors: *Marine animals, *Radioisotopes, Absorption, Marine algae, Marine fish, Invertebrates, Crustaceans, Mollusks, Strontium radioisotopes, Zinc radioisotopes, Iodine radioisotopes, Cobalt radioisotopes, Water pollution effects.
Identifiers: Cesium radioisotopes, Cadmium radioisotopes, Cerium radioisotopes, Echinoderms.

A compartmental model was used to correlate experimental data on radionuclides (Cs, Sr, Zn, Cd, Ce, I, and Co) uptake by marine algae, fish and invertebrates. For some systems the concentration factors varied with time as much as 100-fold. (Bopp-NSIC)
W71-09850

TURNOVER AND CONCENTRATION OF RADIONUCLIDES IN FOOD CHAINS,
Oak Ridge National Lab., Tenn. Health Physics Div.
D. E. Reichle, P. B. Dunaway, and D. J. Nelson.
Nuclear Safety, Vol 11, No 1, p 43-55 (Jan-Feb 1970).

Descriptors: *Food chains, *Mathematical models, *Radionuclides, Radioactivity effects, Water pollution effects, Nuclear wastes, Public health, Metabolism, Toxicity.

More substantial bioenvironmental information will be required to evaluate future nuclear installations. A simple source-pathway-receptor model requires pathway identification, data on assimilation by each link (organism) in the pathway, and determination of the biological turnover of each radionuclide. For chronic releases of radioactivity to the environment, evaluation of the concentration factors alone will often suffice; for acute releases, evaluation of other biological variables is needed to predict the time-dependent radionuclide concentrations in organisms. The biological concentration and turnover of radionuclides by animals are summarized in this paper, and data are presented for use in environmental models and correlation with characteristics (e. g., body size) that allow estimation of absolute values for many different animal groups based on existing experimental data. (Bopp-NSIC)
W71-09851

RESEARCH ON ECOLOGICAL STUDIES ON THE DYNAMICS OF PLANKTONIC BLUE-GREEN ALGAE WITH SPECIAL REFERENCE TO THEIR MICROSTRATIFICATION.
Minnesota Univ., Minneapolis.

COO-1820-2 (1970), 6 p.

Descriptors: *Aquatic algae, *Lakes, *Phytoplankton, *Density stratification, Speciation, Vertical migration, Aquaria, Growth rates, Sedimentation, Buoyancy, Wind velocity, Convection, Watter pollution effects.

Species associations at various depths are fortuitous, transient, and dependent upon physical control manifest by the abiotic environment, rather than upon any direct biological control. Individuals comprising the phytoplankton community are not bound to a substrate, and are entirely mobile. Vertical distribution is influenced by differential growth rates at various depths, sedimentation, buoyancy, wind, and thermal convection. Currently, proportionately more time is being devoted with several laboratory models of the study lakes. (Bopp-NSIC)
W71-09852

EFFECTS OF CHRONIC EXPOSURE OF CHINOOK SALMON EGGS AND ALEVINS TO GAMMA IRRADIATION,
Washington Univ., Seattle. Coll. of Fisheries.
L. R. Donaldson, and K. Bonham.
Transactions of the American Fisheries Society, Vol 99, No 1, Jan 1970, p 112-119.

Descriptors: *Chinook salmon, *Radioactivity effects, *Fish eggs, Fry, Water pollution effects, Gamma rays, Columbia River.

Chinook salmon eggs and alevins were exposed continuously to low levels of gamma radiation from the instant of fertilization until the yolk sac was completely absorbed. The level of irradiation exposure was gradually increased from 0.5 roentgen/day for the 1960 brood year to 10 roentgen/day for 1968. (The total exposure for 1968 was 820 roentgen.) There were no damaging effects found at 0.5 roentgen/day. Data for the higher levels of exposure will be evaluated as the adults return from the sea. (Bopp-NSIC)
W71-09853

EXCRETION OF IODINE BY PERCH,
Helsinki Univ. (Finland).
S. Takatalo, S. Kolehmainen, and J. Miettinen.
Transactions of the American Fisheries Society, Vol 99, No 3, Jul 1970, p 515-517, 2 fig.

Descriptors: *Iodine radioisotopes, *Perches, Absorption, Instrumentation, Radioactivity techniques, Metabolism, Water pollution effects.

Biological half lives of iodine in perch were determined at 13 and 25C by whole body counting of I-131. Iodine excretion followed a two-exponential function. At 13C the half life of the slow component was 9 days; the fast component, 1.5 days. At 25C the half lives were 5 days and 15 hours, respectively. The slow component is believed to represent clearance from the thyroid organ; the fast component, clearance from plasma. (Bopp-NSIC)
W71-09854

RADIATION ECOLOGY IN FRESHWATER COMMUNITIES,
Battelle Memorial Inst., Richland Wash. Pacific Northwest Labs.
C. E. Cushing.
Available from NTIS. Report BNWL-SA-3291, May 21, 1970, 17 p, 22 ref. AEC Contract No At (45-1)-1830.

Descriptors: *Radionuclides, *Aquatic life, *Public health, *Ecology, Oligotrophy, Phosphorus radioisotopes, Strontium radioisotopes, Iodine radioisotopes, Zinc radioisotopes, Cobalt radioisotopes, Absorption, Water pollution effects, Nuclear wastes, Reviews, Columbia River, Food webs.
Identifiers: Yttrium radioisotopes, Zirconium radioisotopes, Ruthenium radioisotopes, Cesium radioisotopes, Barium radioisotopes, Cerium radioisotopes, Scandium radioisotopes, Chromium radioisotopes, Manganese radioisotopes, Iron radioisotopes, Sodium radioisotopes, Copper radioisotopes, Arsenic radioisotopes.

This short review considers the following aspects of radionuclide cycling: (1) the mode of uptake, (2) rates of uptake, (3) retention-elimination, (4) food-web relationships, (5) environmental effects, and (6) dispersal of radionuclides. It is concluded that the presence of radionuclides in the freshwater environment, disregarding their source, can provide us with a wealth of ecological data. Information ranging from the movement of a single element from one organism to another, or from one tissue to another, to data helping to unsort the complexities of entire aquatic food-webs can be gained with properly designed experiments and treatment of the data. The dynamics of radionuclide cycling are basically no different from their stable counterparts, but their value lies in the increased precision of measurement, particularly at concentrations too low to measure by standard analytical procedures. (Bopp-NSIC)
W71-09855

POLONIUM-210 AND LEAD-210 IN THE MARINE ENVIRONMENT,
Department of Industries, Cape Town (South Africa). Div. of Sea Fisheries.
L. V. Shannon, R. D. Cherry, and M. J. Orren.
Geochimica et Cosmochimica Acta, Vol 34, 1970, p 701-711.

Descriptors: *Lead radioisotopes, *Sea water, *Phytoplankton, *Zooplankton, Absorption, Water pollution effects, Biology, Geochemistry, Ocean currents, Radioactivity techniques.
Identifiers: Polonium radioisotopes.

A method is outlined for determination of lead-210 and polonium-210 in sea water by solvent extraction, followed by electrodeposition and alpha counting. The mean activities of 29 samples collected at a depth of 20 m in the sea around the Cape of Good Hope during March 1969 were 38 x 10 to the minus 15th power c/l for lead and 20 x 10 to the minus 15th power c/l for polonium. Variations in concentrations could in part be ascribed to different water masses and current systems. For 11 zooplankton and 3 phytoplankton samples collected during the same period, the mean activities were 33 pc/kg wet weight for lead and 399 pc/kg wet weight for polonium. Using the data presented and making certain assumptions, removal times from the upper mixed layer were calculated to be about 5 yr for lead-210 and 0.6 yr for polonium-210. (Bopp-NSIC)
W71-09856

RADIOACTIVITY CONTENTS IN SOME PLANKTON AND SEA WATER SAMPLES COL-

LECTED DURING THE PERIOD BETWEEN 1960 AND 1968,
Parma Univ. (Italy).
L. Tassi-Pelati, and C. Truilzi.
Energia Nucleare (Milan), Vol 16, No 5, p 311-320, 1969, 5 fig, 4 tab, 15 ref.

Descriptors: *Radioisotopes, *Plankton, *Protozoa, *Strontium radioisotopes, Potassium radioisotopes, Radium radioisotopes, Absorption, Oceans, Water pollution sources, Fallout, Water pollution effects.
Identifiers: Cerium radioisotopes, Europium radioisotopes, Manganese radioisotopes, Promethium radioisotopes, Antimony radioisotopes, Zirconium radioisotopes.

Accumulation of strontium-90 by Ligurian plankton containing the protoza Acantharia which has a skeleton containing SrSO4 and by Adriatic plankton containing no Acantharia was compared. A higher level of radioactivity in the Ligurian Sea than in the Adriatic was attributed to the uptake of strontium-90 by Acantharia. It was concluded that species of Acantharia are useful as strontium-90 indicators. Radioactivity in plankton in the northern Adriatic and Ligurian Seas from 1961-68 followed closely the fallout. Strontium-90, cerium-144, europium-155, manganese-54, promethium-147, antimony-125, zirconium-95, potassium-40, and radium-226 were measured by radiochemical methods in selected samples of plankton and seawater. It was concluded that plankton may be used as an immediate indicator of environmental contamination from radioactive fallout. (Bopp-NSIC)
W71-09857

HAZARDS OF INTERNAL CONTAMINATION OF A HUMAN POPULATION FROM THE RADIOACTIVE POLLUTION OF WATERS, (IN FRENCH),
Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
R. Bittel, and G. Lacourly.
Available from NTIS. Report CEA-CONF-1548, 1970, 12 p.

Descriptors: *Food chains, *Radioisotopes, *Radioactivity effects, Human population, Public health, Water pollution effects, Nuclear wastes, Mathematical models.

A simple model is used to estimate the contamination of population groups from the aquatic food chain. The effects of varying parameters (amount of ingested food, ecological and physiological transfer factors) are studied. The model is used to obtain the doses delivered from drinking water, water used for irrigation, inland aquatic food chains, and marine food chains. (Bopp-NSIC)
W71-09858

RESEARCH ON THE MARINE FOOD CHAIN, PROGRESS REPORT, JULY 1969-JUNE 1970, PART III,
California Univ., San Diego-La Jolla. Inst. of Marine Resources.
J. D. H. Strickland.
Available from NTIS. Report UCSD-10-P-20-68, (1970). 257 p.

Descriptors: *Food chains, *Sea water, *Oceanography, Nutrients, Salinity, Productivity, Temperature, Phosphates, Nitrates, Silicates, Ureas, Instrumentation, Fathometers, Plankton, Phaeophyta, Chlorophyll, Photosynthesis, Water pollution effects, Pollutant identification.

During cruises based from Callao, Peru, oceanographic parameters were mapped continuously: temperature, salinity, nitrate, silicate, and chlorophyll fluorescence; and vertical profiles were obtained for plant nutrients (nitrate, ammonium, urea, silicate, and phosphate) and chlorophyll fluorescence. Methods of measurement and computer programming are discussed. (Bopp-NSIC)
W71-09859

RADIOACTIVITY AND FALLOUT: THE MODEL POPULATION,
Brookhaven National Lab., Upton, N.Y.
George M. Woodwell.
Available from NTIS as BNL-12401 (1967). Proceedings of the Symposium on Challenge for Survival, Columbia University Press, New York, 1970, p 159-169.

Descriptors: *Water pollution effects, *Radioisotopes, *Human population, Public health, Strontium radioisotopes, Pesticides, DDT, Persistence, Toxicity, Hazards, Pesticide residues, Radioactivity, Water pollution sources.
Identifiers: Cesium radioisotopes, Iron radioisotopes.

Problems of releasing both radioactive and chemical toxic material into the environment are discussed with respect to hazards to populations. The common assumption that the environment is large enough for toxic materials to dilute into innocuousness (on a world-wide scale is questioned with respect to various isotopes such as cesium-137, strontium-90, and iron-55; and with regard to various persistent pesticides, especially DDT. (Bopp-NSIC)
W71-09860

RADIOACTIVITY TRANSPORT IN WATER: SUMMARY REPORT,
Texas Univ., Austin. Center for Research on Water Resources.
For primary bibliographic entry see Field 05B.
W71-09861

INFLUENCE OF THE PHYSIOCOCHEMICAL FORM OF RUTHENIUM ON CONTAMINATION OF MARINE ORGANISMS, (In French),
Departement de la Protection Sanitaire, Cherbourg (France). Section de Radio-ecologie.
For primary bibliographic entry see Field 05B.
W71-09863

WATER QUALITY INFLUENCES ON OUTDOOR RECREATION IN THE LAKE ONTARIO BASIN,
Bureau of Outdoor Recreation, Ann Arbor, Mich.
Robert J. Henley.
In: Proceedings, Tenth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc, 1967, p 427-440.

Descriptors: *Water quality, *Recreation, *Swimming, *Water pollution effects, Bacteria, Algae, Fish, Sewers, Runoff, Wastes, Water supply, Effluents, Streams, Lakes, Rivers, Reservoirs, Boating, Euthrophication.
Identifiers: *Lake Ontario, Water turbidity, Industrial plants, Water sports.

The relationships between water quality and the uses of recreational water resources in the Lake Ontario basin are surveyed. There is a discussion of water quality indices (high bacteria counts, algae masses, fish mortality and water turpidity). Recreation value of water is analyzed in light of the influence of poor water quality on swimming, with particular attention to situations in which swimming has been banned by public officials. The value of pollution control to such water recreation is stressed. Predictions are made for the future demand of the public for swimming and other water-related recreation activities and indications point to an increase in this demand. (Murphy-Rutgers)
W71-09880

5D. Waste Treatment Processes

REMOVAL OF RADIOISOTOPES FROM LIQUID WASTES BY SORPTION IN LOCAL MINERALS,
Atomic Research Centre, Bombay (India).
U. Chandra.
Availability: NTIS. BARC-454, 1970. 29 p.

Descriptors: *Waste disposal, *Waste water treatment, Radioactive waste disposal, Water pollution sources, Absorption, Clays, Ion exchange, Cesium.
Identifiers: India.

Various naturally occurring minerals available in India have been extensively investigated for their suitability for treatment of radioactive liquid wastes at Trombay. Four general classes of sorbents were taken up for study and chiefly among the minerals are, Vermiculite, Attapulgite, Bentonite, and Lignite type coal products. It is concluded that though Vermiculite has been widely used as fixed bed ion exchange material, Attapulgit too is a very potential mineral because of its exceptionally high selectivity for radiocesium even in presence of macro amounts of inactive sodium in the waste solutions. (Houser-NSIC)
W71-09517

A REVIEW OF THE LITERATURE OF 1968 ON WASTEWATER AND WATER POLLUTION CONTROL - INDUSTRIAL WASTE, RADIOACTIVE,
For primary bibliographic entry see Field 05G.
W71-09521

REUSE OF CHEMICAL FIBER PLANT WASTE WATER AND COOLING WATER BLOWDOWN,
Fiber Industries Inc., Charlotte, N.C.
William J. Day.
Copy available from GPO Sup Doc as EP2.10:12090EOX10/70, $0.70; microfiche from NTIS as PB-200 695, $0.95. Water Pollution Control Research Series, October 1970. 66 p, 15 fig, 5 tab, 15 ref. EPA Grant No WPRD-100-01-68, Program No 12090 EUX 10/70.

Descriptors: *Water reuse, *Domestic wastes, *Industrial wastes, Activated sludge, Trickling filters, Lagoons, Tertiary treatment, Activated carbon, Flocculation, Algae, Sludge, Chromium, Toxicity, Neutralization, Hydrogen ion concentration, Temperature, Biochemical oxygen demand, Chemical oxygen demand, Cooling towers, *Waste water treatment.
Identifiers: *Micro screening.

Waste waters from a Fortrel Polyester manufacturing plant consisted of organic chemical process wastes, cooling system blowdown, and sanitary wastes from the plant. A water reuse program was instituted which consisted of: (1) pretreatment of cooling waters for removal of heavy metals; (2) in-plant modifications and additions to the existing system to increase treatment plant capacity; and (3) a post treatment system for effluent polishing prior to selected reuse. The final system consisted of: (1) a chromate reduction unit rated at 120 gpm for concentrations of up to 300 mg/l CrO4 and designed for continuous operation; (2) equalization basins having a combined capacity of 195,000 gallons and containing sufficient mixing capacity to prevent short-circuiting and stratification; (3) a plastic media roughing filter consisting of two tiers of poly-vinyl chloride media 10 feet thick and 25 ft in diameter; (4) an aeration basin equipped with 175 hp of aeration and mixing capacity and using 100% recycle of clarifier sludge; (5) a peripheral flow type clarifier; (6) two series connected polishing ponds; (7) a micro screen or algae screen; (8) a flocculant and/or carbon unit; (9) a sludge pond; and (10) a digester. Chromium was removed from the cooling tower blowdown for $.21 per pound of chromate removed. The plastic media trickling filter, used as a roughing filter, provided 40% BOD removal over a wide range of loading rates. The 0.33 mgd industrial and domestic waste water was treated and reused at a rate of 0.10 mgd for approximately 40 cents/1000 gallons. (Lowry-Texas)
W71-09524

MATHEMATICAL MODEL OF THE ELECTRODIALYSIS PROCESS,
Process Research, Inc., Cambridge, Mass.
Kenneth T. Pruyn, Joseph J. Harrington, and J. Douglas Smith.

Copy available from GPO Sup Doc as I67.13/4:17090 FTA 7/69, $0.70; microfiche from NTIS as PB-200 721, $0.95. Water Pollution Control Research Series, July 1969. 70 p, 3 fig, 3 tab, 18 ref. FWQA Contract No 14-12-410, Program 17090 FTA 07/69.

Descriptors: *Computer simulation, *Mathematical models, Feasibility studies, Cost analysis, Electrodialysis, Separation techniques, Membrane processes, Semipermeable membranes, Anions, Cations, Demineralization, Desalination, Resistivity, Flow, Acid, Storage, Instrumentation, Pipes, Pumps, *Waste water treatment.

An electrodialysis unit was established as a control volume, and material balances around the control volume were formulated, involving input and output flows, types of charged particles to be exchanged, concentrations of charged particles, and percentage removal of individual ions as well as percentage removals of total ions. Significant parameters involved included spacer design geometry, membrane properties (resistivity, current efficiency, separation factors, etc.) and mode of operation of the stack (current density, products stream concentration, waste/product ratio, waste stream pH, etc.). Performance equations were then formulated for resistivity, D.C. power input, current efficiency, number of stacks required, and the pumping headloss. Cost analyses were then derived to include: (1) electrodialysis stacks, stack piping, distribution piping, and pumps for stack related costs; (2) rectifiers and process electrical for D.C. power costs; and (3) acid storage tanks, acid feed pumps, instruments, and miscellaneous equipment for auxiliary costs. Equations derived for capital costs were based on the January 1965 Engineering News-Record cost index. Operational costs were estimated and evaluated in the same manner. The program was run for plants of 1, 10, and 100 MGD, with capital and operating costs being $164,620 and 7.07 cents/1000 gallons respectively for a 1 MGD plant. Program flow charts as well as actual computer outputs are presented. (Lowry-Texas)
W71-09525

AEROBIC SECONDARY TREATMENT OF POTATO PROCESSING WASTES.
French (R. T.) Co., Shelley, Idaho.

Copy available from GPO Sup Doc as EP.2.10:12060 EHV 12/70, $1.50; microfiche from NTIS as PB-200 623, $0.95. Water Pollution Control Research Series, Dec 1970. 110 p, 68 fig, 5 tab, 13 ref. EPA Grant No WPRD 15-01-68, Program No 12060 EHV 12/70.

Descriptors: *Potatoes, *Industrial wastes, Activated sludge, Cost analysis, Technical feasibility, Economic feasibility, Aeration, Temperature, Alkalinity, Hydrogen ion concentration, Organic loading, Kinetics, Chemical oxygen demand, Biochemical oxygen demand, Dissolved oxygen, Chlorination, Disinfection, Coliforms, Sludge, Vacuum drying, Dewatering, *Waste water treatment.
Identifiers: *Food processing, Suspended solids.

The R. T. French Company, of Shelley, Idaho, has demonstrated the feasibility of using a complete mix activated sludge unit for secondary treatment of potato processing wastes. During the 1969-1970 processing season, both the activated sludge process and a flow through aeration process without secondary clarification were studied. The activated sludge unit was demonstrated to be capable of BOD removals, in excess of 90% over extended periods, with coliform removals in excess of 96%. With the flow through system, BOD removals ranged between 70 and 80%. Analysis of data obtained revealed that both the quantity of excess sludge produced and the amount of oxygen required were functions of the BOD removal rate and the mixed liquor volatile suspended solids concentration. The substrate removal rate coefficient was shown to be temperature dependent. The prevailing low air temperatures at the Shelley location did not cause system failure, but data obtained demonstrated the need to consider temperature loss in system design. Total annual treatment costs, excluding costs for waste activated sludge disposal, were estimated to be $.038 per lb BOD applied, and $.021 per lb COD applied. Operation of thickener-clarifier on combinations of silt and biological solids was not successful. Failures with this unit demonstrated a need for the development of special silt removal and handling equipment for potato processing. (Lowry-Texas)
W71-09526

A TECHNIQUE FOR IRRIGATING BOTTOM LAND HARDWOOD TREES WITH PAPERMILL EFFLUENT IN NORTH LOUISIANA,
Louisiana Polytechnic Inst., Ruston.
Ishtiaq Ahmed.
Masters Thesis, May 1970. 68 p, 2 fig, 6 tab, 43 ref. OWRR Project A-013-LA (1).

Descriptors: *Pulp and paper industry, *Irrigation, Industrial wastes, *Water reuse, Trees, Hydrologic cycle, Plant growth, Evaporation, Evapotranspiration, Interception, Precipitation (Atmospheric), Runoff, Storage, Temperature, Sampling, Color, Turbidity, Cost analysis, Waste water treatment.

Bottom land hardwood trees in Louisiana were irrigated with both black water and white water effluents from local papermills. Analyses were performed on the waters to determine the individual constituents and characteristics of each. White water was found to be predominantly sodium, while the major component of black water was found to be sodium bicarbonate. Average annual precipitation for the area was found to be 53 inches per year. Tests were conducted which established 19.3 inches/year the maximum permissible amount of mill effluent, mixed 9 parts of white water to 1 part of black water, which could be used to irrigate the forests to obtain optimum growth. The optimum growth recorded was 6.03% per year. Trees would be irrigated from April through September, the time when most tree growth occurs. Based on a life expectancy of 20 years, the cost of the project was determined to be $7.43 per acre per year. Further research is needed in the form of a tree improving program to determine the optimum tree species for this particular application. Varying proportions of white water to black water should also be experimented with in order to achieve optimal conditions throughout the system. (Lowry-Texas)
W71-09527

WATER FILTRATION OPTIMIZATION BY GEOMETRIC PROGRAMMING,
Texas A and M Univ., College Station. Dept. of Industrial Engineering.
Duane J. Wray.
MS Thesis. 54 p, 4 fig, 55 ref. OWRR Project A-011-TEX (3).

Descriptors: *Filtration, *Operations research, Mathematical studies, *Optimization, Flow, Headloss, Sands, Waste water treatment.
Identifiers: *Geometric programming, *Multimedia beds, Backwash.

Water filtration has been prepetuated since its conception by mainly 'rule of thumb' design with little mention made of actual determination of mechanisms by which filters work. Therefore, designs have been of the classical form, conforming not to economics or performance, but to tradition. Establishment of the various operational parameters has allowed the process to become amenable to economic optimization by the method of geometric programming. The method was applied to multi-media filters where the primary variables were: (1) depth of each media; (2) flow rate; (3) length of filter run; (4) head loss; and (5) equivalent grain diameter. Primary costs included original media cost amortized over a specified period, and the cost of the backwash water. A sample problem was analysed using the geometric programming method. The values used were those which could conceivably be from a typical plant. The ease with which the sample problem was analyzed demonstrated the feasibility of the method as a practical design tool for engineers. The use of computers for performing the calculations would make geometric programming even more attractive, and work is continuing along those lines. (Lowry-Texas)
W71-09528

THE EFFECT OF IRRIGATION WITH MUNICIPAL SEWAGE EFFLUENT AND SLUDGE ON SELECTED TREES, GRASSES, AND LEGUMES PLANTED IN BITUMINOUS STRIP-MINE SOIL,
Pennsylvania State Univ., University Park. Dept. of Forestry and Wildlife.
John Allen Dickerson.
Master's Thesis, Mar 1971. 88 p, 26 fig, 18 tab, 21 ref. OWRR Project B-020-PA (5).

Descriptors: *Strip mine wastes, *Acid mine water, *Vegetation establishment, Municipal wastes, Sludge, Water reuse, Trees, Grasses, Fescues, Germination, Mortality, Acidity, Hydrogen ion concentration, Alkalinity, Toxicity, Temperature, Monitoring, Sampling, Percolation, Pennsylvania.
Identifiers: *Survival.

Many areas of Pennsylvania are covered with harsh bituminous spoils which have repeatedly resisted revegetation because of the toxicity of the spoil banks. 10 boxes each holding 512 cu ft or approximately 25 tons of material, were filled with spoil material from the Lower Kittanning bituminous coal seam. These boxes were then irrigated with municipal sewage plant effluent and sludge. The boxes were planted with seven tree species, two grass species, and two legume species with random arrangement. The 10 boxes were paired for weekly irrigation with sludge and effluent as follows: (1) control (no irrigation); (2) two inches effluent; (3) one-inch effluent and one-inch sludge; (4) two inches effluent and two inches sludge; and (5) 2 inches sludge. Temperatures, soil moisture content, and percolate quality were monitored for a 24 week period. Results of these tests showed that black locust trees had a survival rate overall of 90% and white pine trees had a survival rate of 74%. These factors combined with the excellent' growth of both orchard grass and tall fescue suggested that municipal sludge and sewage effluent can help to ameliorate harsh conditions found on bituminous spoil banks. The spoil material used in this study had resisted conventional revegetation for 23 years, due mainly to highly acid (pH less than 3.0) and toxic conditions. (Lowry-Texas)
W71-09529

SURVEY OF TREATMENT AND RECYCLE OF USED FISH HATCHERY WATER,
New Mexico State Univ., University Park. Dept. of Civil Engineering.
John Burkstaller, and R. E. Speece.
New Mexico State University, Engineering Experiment Station, Technical Report No 64, June 1970. 41 p, 5 fig, 1 tab, 24 ref. WRRI Project A-018-NMEX (2).

Descriptors: *Fish hatcheries, *Water reuse, Temperature, Hydrogen ion concentration, Dissolved oxygen, Ammonia, Fish toxins, *Waste water treatment, Adsorption, Activated carbon, Catalysts, Filtration, Nitrification, Disinfection, Chlorine, Ozone, Ultraviolet radiation, Microorganisms, Viruses, E Coli, Fish diseases, Toxicity, Monitoring, Enzymes.
Identifiers: Bromine.

Re-use of fish hatchery water is becoming more attractive for the following reasons: (1) many water supplies are too cold and must be heated, and on a once through basis all heat remaining is wasted; (2) many areas do not have sufficient water supplies to raise full capacities of fish during dry months, and (3) spatial limitations are also becoming increasingly prevalent. Problems encountered in recycling

of hatchery water include: (1) smaller fish are much more susceptible to certain fish diseases and recycle can take disease producing organisms from older fish and start an epidemic among the younger fish; (2) ammonia is extremely toxic to fish even in very small amounts, and therefore, it must be removed from the water before re-use; and (3) for growing cold water fish, recycle water may become unsuitable since it eventually warms to the temperature of the surroundings. Various treatment methods tested to alleviate these problems include the use of ultraviolet light, chlorine, bromine, chlorine-bromine combinations, and the suggested use of ozone for disinfection. Use of these methods, however, would require additional treatment for residual removal. A typical installation involving U-tube aeration, biological filters for nitrification, and continuous monitoring of pH, D.O. and temperature is presented. (Lowry-Texas)
W71-09530

THE ROLE OF THE ENZYME 1-PHOSPHOFRUCTOKINASE IN THE METABOLISM OF CLOSTRIDIUM PASTEURIANUM W5,
National Inst. for Water Research, Pretoria (South Africa).
J. P. Kotze.
Water Research, Vol 3, 1969, p 83-91. 1 fig, 3 tab, 26 ref.

Descriptors: *Anaerobic digestion, *Anaerobic bacteria, Clostridium, Enzymes, Metabolism, Microorganisms, Hydrolysis, Degradation (Decomposition), Protein, Analytical techniques, Oxidation-reduction potential, Spectrophotometry, Chromatography, Sampling, Waste water treatment.
Identifiers: *Adenosine tri-phosphate, *Adenosine di-phosphate, Absorbance, Buffer, Glucose.

Clostridia have been shown to be the most numerous species of organisms in anaerobic digesters. Many attempts have been made to establish the exact mechanisms by which anaerobic degradation takes place. The metabolic pathways were examined for Clostridium Pasteurianum W5 by analyzing cell-free samples for enzymatic activity. Cl. Pasteurianum W5 has been documented concerning its lack of 6-Phosphofructokinase, and a new metabolic shunt to circumvent this lack of 6-PFK activity in the glycolytic degradation of carbohydrates has been proposed. Cl Pasteurianum W5 was studied in pure culture to allow the sequence of the metabolic pathways to be more easily detected and studied. Glycose, fructose, mannitol, and sorbitol were used as substrates. Thin layer chromatography and spectrophotometric methods were utilized to detect small concentrations of enzymes. Hexose and hexitol degradation was found to proceed through the use of a 1-phosphofructokinase and mannitol-1-phosphate dehydrogenase shunt mechanism, while the lack of 6-phosphofructokinase had no significance. This work more fully elucidated the actual pathways by which anaerobic digestion proceeds in the clostridia, but further investigations continue. (Lowry-Texas)
W71-09531

AEROBIC HETEROTROPHIC BACTERIAL POPULATIONS OF SEWAGE AND ACTIVATED SLUDGE, IV. ADAPTATION OF ACTIVATED SLUDGE TO UTILIZATION OF AROMATIC COMPOUNDS,
Rutgers - The State Univ., New Brunswick. Dept. of Environmental Sciences.
T. B. S. Prakasam, and N. C. Dondero.
Applied Microbiology, Vol 19, No 4, p 663-670, Apr 1970. 3 fig, 4 tab, 15 ref. FWQA Program 17050 DFL 04/70.

Descriptors: *Enzymes, *Aromatic compounds, Sewage, *Viability, Population, Aeration, Acclimatization, Nutrients, Heterogeneity, Biochemical oxygen demand, Filtration, Phosphates, Chlorides, Sulfates, Activated sludge, Waste water treatment.
Identifiers: *Enzyme repression, Stainer's technique, Glucose.

An activated sludge from a sewage treatment plant and a laboratory activated sludge developed on an artificial waste were compared for their ability to utilize 11 aromatic compounds. The settled sewage from a treatment plant in Marlboro, New Jersey was used as an inoculum to develop activated sludges in a laboratory. Mixed liquor from aeration tanks was used as authentic activated sludge the artificial waste consisted of nutrient broth solids, glucose and salts. Sludge extract media was prepared by autoclaving 250 ml of the mixed liquor suspended solids acclimated to particular aromatic compound at 121 deg C for 15 minutes. Oxygen uptake was studied by usual monometric techniques, using constant volume respirometers and 15 ml flasks with 0.2 ml of 15% (w/v) KOH at 20 deg C. A sample of laboratory grown activated sludge unacclimated to aromatics and another mixed liquor from Marlboro sewage treatment plant were plated on artificial wastes. There were marked differences in numbers of organisms able to utilize the various aromatic compounds. After 3 weeks visible counts of sludges were between 286-354 million/ml. Counts for laboratory activated sludge were higher on all media, than corresponding counts for treatment plant activated sludge. (See also W71-09533) (Lowry-Texas)
W71-09532

AEROBIC HETEROTROPHIC BACTERIAL POPULATIONS OF SEWAGE AND ACTIVATED SLUDGE. V. ANALYSIS OF POPULATION STRUCTURE AND ACTIVITY,
Cornell Univ., Ithaca, N.Y. Dept. of Food Science.
T. B. S. Prakasam, and N. C. Dondero.
Applied Microbiology, Vol 19, No 4, p 671-680, Apr 1970. 2 fig, 7 tab, 17 ref. FWQA Program 17050 DFL 04/70.

Descriptors: *Activated sludge, *Aromatic compounds, Heterogeneous populations, Systematics, Frequency, Flocculation, Diversion, Oxidation, Sewage, Waste water treatment.
Identifiers: *Catechol sludge, *Artificial waste, *Microbial populations, Benzoate, Substrate utilization ability index, Oxidation index.

The confidence interval method and mountford's index were tested in analyses of the microbial populations of 11 laboratory activated sludges acclimated to aromatic compounds. The gross and microscopic differences between the sludges acclimated were strongly indicative of profound changes during the adaptation of laboratory sludge. The microscopic populations were present in higher numbers in heterologously acclimated sludges than in homologously acclimated sludges. To evaluate the abilities of the bacteria and the oxides of the aromatic substrates a 'Substrate utilization ability index' (SUAI) was computed and compared with an 'Oxidation index' (OI). A high OI value indicated sludge had ability to oxidize corresponding substrates to a high degree. The sludges are compared to one another in a series of pairs accounting for bacterial types and frequencies. From the data compiled confidence limits around the mean (y) of the total differences were calculated and the level of significance was chosen at 10%. Analysis by Mountford's method provided quantitative comparison over the entire set of sludges and any desired groupings through the lowest common similarity values. Attempts at population analyses indicated each acclimated sludge differed greatly in microbial constitution. Analyses of the data by a statistical method used quantitative and objective evidence that the resulting populations were quite divergent in their microbial composition during the period of investigation. In retrospect, the need of further tests of the sensitivity of methods of population analysis of bacteria is evident. (See also W71-09532) (Lowry-Texas)
W71-09533

SYMPOSIUM-FIELD EVALUATION OF LAS AND ABS TREATABILITY.
Proctor and Gamble Co., Cincinnati, Ohio. Sanitary Engineering Research Services.

Proceedings, Industrial Waste Conference, 21, Vol L, No 2, p 724-756. 20 fig, 4 tab, 6 ref.

Descriptors: *Alkybenzene sulfonates, *Linear alklate sulfonates, *Biodegradation, *Detergents, *On-site tests, Surfactants, Biochemical oxygen demand, Chemical oxygen demand, Sewage treatment, Waste water treatment, Ohio, Virginia, Wisconsin.
Identifiers: Columbus (Ohio), Woodbridge (Virginia), Manassas (Virginia), Plymouth (Wisconsin).

Four carefully documented on-site tests conducted at sewage treatment facilities evaluated the biodegradability of a new detergent surfactant, linear alkyl sulfonate (LAS), and compared its biodegradability to that of alkyl benzene sulfonate (ABS). Each study was carried out under the supervision of a different university and all found LAS-based detergent products were much improved in degradability over ABS products in similar operating conditions. Other significant conclusions were: (1) efficiency of LAS removal depended upon the efficiency of BOD removal, i. e., a system with 80 to 90% BOD removal could expect to degrade 80 to 90% of LAS, (2) effluent concentrations of active substance from an aeration-type treatment were reduced to 1-2 mg/l after changing to the use of LAS-based products, and (3) under corresponding conditions of 12 hour detention period and mixed liquor suspended solids of around 1500 parts per million, LAS removal was 70% compared to 30-50% for ABS. Graphs and data may be useful in the operation, treatment, and the design of new plants when LAS-based products come into general use. (Burdette-Texas)
W71-09534

ON IMPROVING WASTE WATER QUALITY,
Mobil Oil Co., East Chicago, Ind.
J. A. Hart.
Water and Sewage Works, Vol 117, No 9, Sept/Oct 1970, p IW/20-IW/26. 3 fig, 3 tab, 1 ref.

Descriptors: *Pollutants, *Waste water treatment, Oxidation, Effluents, Flocculation, Biochemical oxygen demand, Chlorination, Chemical oxygen demand, Indiana.
Identifiers: *Air-flotation, *Stripping, Sour-water, Great Lakes-Illinois River Basin Survey (GLIRB), Influent, Polyelectrolyte.

In February, 1965, a sour water stripper was put into service at Mobil Oil Company's East Chicago Refinery located on the Indiana Harbor Ship Canal. As a result the water's visual appearance was improved by the elimination of a black precipitate caused by sulfides. Sour water stripper's bottoms were of excellent quality containing essentially no sulfide, only 15 mg/l of ammonia-nitrogen and their reuse achieved a phenol reduction of 90%. In July, 1967 new criteria for the Indiana Harbor Ship Canal were restricted to require additional improvement in the quality of Mobil's wastewater effluent. It appeared that treatment should be provided for reducing oil content, suspended solids, phenols, ammonia-nitrogen and BOD. Another major objective was to improve the water's quality to permit further reuse as makeup in the refinery's cooling towers, reducing effluent volume and offering possibilities of reducing phenol and BOD. The objectives were all met by installing an air-flotation unit as a secondary treatment process. The results of the unit showed that a polyelectrolyte should be used to obtain the best possible water quality for reuse as cooling tower make-up. Before completion of the air-flotation installation several tests were run to determine effects of changing sour water stripper bottoms to cooling towers. The results indicated the existence of an environment in the cooling towers favorable for oxidizing phenols. No odors which would cause air pollution were de-

tected in the air leaving the cooling towers. (Lowry-Texas)
W71-09535

DESIGN GUIDES FOR BIOLOGICAL WASTE WATER TREATMENT PROCESSES-LABORATORY STUDIES OF THE PERFORMANCE OF THE CONTACT STABILIZATION PROCESS,
Texas Univ., Austin. Center for Research in Water Resources.
Donnie W. Berryhill, Joseph F. Malina, Jr., and Rolf Kayser.
Technical Report EHE-70-16, CRWR-62, Texas University, Austin. 55p. FWQA Grant No WPRD 178-01-68.

Descriptors: *Activated sludge, *Organic loading, Biochemical oxygen demand, Aeration, Dissolved oxygen, Mixing, Acclimatization, Sampling, Sludge, Municipal waste water, *Waste water treatment, Texas.
Identifiers: *Contact stabilization, Suspended solids, Detention time, Oxygen uptake, Austin (Tex).

Laboratory scale tanks being fed 4 l/hr of waste water containing 100 mg/l Total BOD were operated as contact stabilization tanks. Volume of the stabilization tank was held constant at 4 liters throughout the experiment, while volume of the contact tank was varied between 1/2 and 4 liters. Organic loadings ranged from 0.31 to 0.72 lbs BOD per pound total suspended solids per day, with removal rates ranging from 0.24 to 0.51 lb BOD lb TSS/day. One run was made with the system operated as a complete mix activated sludge unit. At loadings of 1.04 lb BOD/lb MLSS, .91 lbs/BOD/lb MLSS/day were removed. A dissolved oxygen probe attached to a battery powered mixer was used to measure oxygen uptake rates, which varied from 43 to 191 mg/l/hr in the contact stabilization units, and from 123 to 186 mg/l/hr in the activated sludge units. Short contact periods of from 10 to 15 minutes were sufficient to reduce the soluble BOD in the waste water to low levels, but substrate removal limits were not exceeded in any of the runs. Therefore, no minimum contact or stabilization periods could be established. Further oxygen studies using the prescribed testing procedures should be performed to supplement the data obtained. (Lowry-Texas)
W71-09536

ACCELERATED DIGESTION OF CONCENTRATED SLUDGE,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
Adnan Shindala, Joseph V. Dust, and Alvin L. Champion.
Water and Sewage Works, Vol 47, No 9, p 329-332, Sept 1970. 2 fig, 3 tab, 16 ref.

Descriptors: *Digestion process, *Sewage, *Sludge, Anaerobic digestion, Economics, Alkalinity, Hydrogen ion concentration, *Waste water treatment.
Identifiers: *Thickening, Volatile acids, Temperature.

A study was made of the digestion of concentrated domestic sludge. The purpose of the investigation was: (1) to determine successful digestion of thickened sludge; and (2) to evaluate optimum solids concentrations combined with optimum digestion periods that would produce acceptable volatile solids reductions. Sludges tested with solid concentrations of 5, 15, 25, and 35% were digested for loading periods of 30, 20, 15, and 10 days under constant mesophillic temperature conditions and displacement loadings. Digested sludge with a volatile matter content of 44% was used to start digesters. Conditions inside the digesters were checked every 4 days. Raw sludge used was concentrated to 15%, 25% and 35%. A sludge volume of 1/2 1 was used, and temperature was maintained between 92 deg and 95 deg F. The following parameters of the added sludge were known: (1) weight, (2) percentage of solids and (3) percent of volatile matter. Several factors were observed in order to avoid digester failure: (1) pH, (2) alkalinity, (3) volatile acids and (4) temperature of digestion. With these factors in mind the following control tests were performed on sludge: (1) volatile acids, (2) pH, (3) total alkalinity, (4) volatile solids and (5) total solids. The results showed that concentration had a definite effect upon digestion. Percentage reduction and volatile matter decreased with increased concentration for all loadings. From the data compiled during this study, the following conclusions are drawn: (1) volatile acids and alkalinity increased with increase in solids concentration, (2) pH remained constant indicating pH was not a function of the increase in solids concentrations as long as alkalinity to volatile acids ratio was more than 1, (3) 15% solids produced maximum amount of gas per liter of sludge but 5% produced the most gas per unit of dry solids, (4) The percent reduction in volatile solids decreased with the increase in solids comcentration, and (5) loadings of concentrated sludges up to 10 mg/day produced an acceptable volatile solids reduction. (Lowry-Texas)
W71-09537

USE OF SOIL TO TREAT ANAEROBIC LAGOON EFFLUENT: DESIGN AND OPERATION OF A FIELD DISPOSAL SYSTEM,
Iowa State University, Ames. Dept. of Agricultural Engineering.
Dale H. Vanderholm, and Craig E. Beer.
Transactions of the ASAE, Vol 13, No 5, Sept-Oct 1970, p 562-564, 2 fig, 2 tab, 17 ref.

Descriptors: *Water reuse, *Irrigation, Farm wastes, Percolation, Infiltration, Lagoons, Organic loading, Rates of application, Aeration, Nitrification, Ammonia, Leaching, Sampling, Monitoring, Laboratory tests, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Nitrates, Phosphates, Chlorides, Odor, Insects, Waste water treatment.

12 individual plots of land, each 45 ft x 60 ft were subjected over a 6 month period to intermittent irrigation with effluent from an anaerobic lagoon. The design included: (1) a portable agricultural irrigation system; (2) an adequate drainage system to maintain favorable moisture conditions in the soil profile; (3) a sampling system and procedure to monitor system performance; and (4) measurement devices for inflow, outflow, and pertinent climatic data. Available moisture content (AM) was the criterion used to determine irrigation frequency. A .30 inch per hour application rate was used. Larger rates resulted in ponding and excessive runoff. Samples of the influent were obtained by placing catch pans on the field, while effluent samples were obtained from the sumps in the tile drains. Samples were analyzed for BOD, COD, pH, nitrogen, chlorides, and phosphates. No odor problems or insect nuisance problems developed. No noticable corrosion or clogging problems were experienced in the irrigation equipment. COD, nitrogen, and phosphorus removals averaged 97%, 80%, and 99..% respectively. Chloride was not removed and hence no build-up problems were predicted. This method has been shown to be feasible for treating agricultural wastes, but design criteria depend upon individual conditions, and must be evaluated for each individual case. (Lowry-Texas)
W71-09538

A PRELIMINARY 'LEAST COST' STUDY OF FUTURE GROUNDWATER DEVELOPMENT IN NORTHEASTERN ILLINOIS,
Illinois State Water Survey, Urbana.
A. F. Moench, and A. P. Visocky.
State of Illinois Department of Registration and Education, Circular No 102. 19 p, 10 ref.

Descriptors: *Water requirements, *Illinois, Aquifers, Groundwater, Dolomite, Sands, Gravels, Hydrology, Water utilization, Water management (Applied), Water purification, Cost analysis, Amortization, Waste treatment.

Lake, McHenry, DuPage, Cook, Kane, and Wi Counties in Illinois were analyzed for projecte groundwater usage from 1980 to 2020. Three mai groundwater sources of these areas are: (1) shallo sand and gravel aquifers, (2) shallow dolomit aquifers, and (3) deep sand stone aquifers. Pump age from the shallow aquifers was limited to the known potential yield, but no limit was set for th deep aquifers until such time as the water level fe below the top of the main producing aquifer, which time a rate which produced a constant wate level would be mandatory. Unit costs at well pumps, power, and rehabilitation were estimate and amortized at 6% (in 1970 dollars). Treatmen costs for such treatment as would achieve the sam finished quality as treated Lake Michigan wate were also included. Raw water costs were projecte to vary between 2 and 14 cents/1000 gal dependin upon the depth at the aquifer. Treated water co estimates varied from 22 to 53 cents/1000 gal. townships were found to be deficient in ground water in 2020 by 147 mgd. This advance indicatio allowed the search for alternate water supplies begin long before the shortage became critica (Lowry-Texas)
W71-09539

THE OCCURRENCE OF FUNGI IN ACID-MIN DRAINAGE,
Federal Water Pollution Control Administratio Cincinnati, Ohio.
For primary bibliographic entry see Field 05G.
W71-09541

CARNIVOROUS PLANTS IN ACTIVATE SLUDGE,
Northwestern Univ., Evanston, Ill.
Wesley O. Pipes.
Proceedings, Industrial Waste Conference, 20, V XLIX, No 4, p 647-656, July 1965, 6 fig, 1 tab, ref.

Descriptors: *Rotifers, *Nematodes, *Activat sludge, *Fungi, Sewage, Aeration, Nutrients, A toclaved, Spores, Animal parasites, Waste wat treatment.
Identifiers: *Zoophagus, Hyphae, Organelles, Ag cultures.

The Sanitary Engineering Research Laboratory The University of California, Berkeley prepared study concerned with the predatory fungi fou growing in activated sludge. The fungi derives sustenance by consuming rotifers and nematod believed to play a part in the breakdown of was organic matter and the formation of activat sludge flocs occasionally responsible for bulkin All samples of activated sludge examined predatory fungi were obtained from an experime tal pilot plant at The University. Aeration tan used had a capacity of 600 gallons and treated s tled domestic sewage at aeration times of abou hours. Four methods were employed to study t problem: (1) microscopic observations were us when large numbers of predatory fungi were to found, (2) enrichment culture techniques we preferred for fungi in small numbers, (3) isolati was used in pure cultures using conventio mycological techniques, (4) studies on bulki confirmed that predatory fungi isolated in pure c tures and then transferred to autoclaved sewa would grow in sewage saprophytically. Resu showed fungus was characterized by non-separa hyphae, 6-8 microns in diameter with short later branches. The fungus was undoubtedly the sa one found by Cooke and Ludzack in laboratory tivated sludge culture fed on synthetic industr waste identified as Zoophagus Insidia Zoophagus does not grow in autoclaved sewa Reports established that predatory fungi do occ in activated sludge treating domestic sewage i continuous-flow system. (Lowry-Texas)
W71-09542

FERMENTATION WASTE DISPOSAL IN GREAT BRITAIN,
Borthwick (Thomas) Distillers Co. Ltd., London (England).
C. J. Jackson.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, Mar 1966, p 19-32. 8 tab, 11 ref.

Descriptors: *Fermentation, *Effluents, *Evaporation, *Oxidation, Sludge disposal, Filtration, Distillation, Waste water treatment, Estuaries, Microorganisms, Biochemical oxygen demand, Sewage, Waste disposal.
Identifiers: 'Flocor' installation, 'Polygrid' installation, Dilution, Treatability, Malts, Grains.

In fermentation industries microorganisms are utilized under controlled conditions to produce an end product. The microorganisms need an adequate nutrient medium resulting in a strong effluent after the removal of the main product. The problems in treating distillery effluents are determined by an optimization of 3 factors: (1) legal requirements, (2) technical feasibility and (3) economics and amenities. Since discharge of effluents to rivers and sewers is controlled, some degree of treatment is necessary. The most commonly used methods of treatment are: (1) to the sea and land, (2) precipitation by pH adjustment, (3) precipitation by chemical coagulation, (4) anaerobic decomposition, (5) aerobic decomposition, (6) combinations of aerobic and anaerobic and (7) evaporation/combustion. Before these methods can be considered certain questions are essential: (1) possibility of reducing volume of effluent, (2) is recycling possible with a consequent reduction in strength, (3) water recovery and recycling (4) if material removal from effluent can be sold or given away. Evaporation is the most commonly used method for receiving solids from effluent, but not always the most economical. TA 'Flocor' plant was tested in Scotland for treating condensate from evaporation of malt distillery spent wash. Mixture has BOD of 1,200 mg/l. Loadings on 3 stage unit are 5 lb/BOD/cu.yd/day and recirculation of 3:1 is used to provide wetting of filter elements. When the plastic filters were used results showed each stage loaded 5 lb/BOD/cu.yd/day removing 55% of load and effluent recirculation rate of 9:1. This performance indicated 'Flocor' installation would be more economical than conventional biological filters. (Lowry-Texas)
W71-09543

THE ECONOMICS OF REGIONAL POLLUTION CONTROL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
Rolf A. Deininger.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, p 815-883. 11 fig, 1 tab, 12 ref.

Descriptors: *Waste water treatment, *Water quality, Economics, Systems analysis, Linear programming, Biochemical oxygen demand, Oxygen, *Water pollution control, *Regions, *Evaluation, Costs.
Identifiers: Mathematical formulation.

Investigations were carried out concerned with two main problems: (1) how treatment at various plants should be established to minimize total costs of waste treatment, and (2) consideration of the degree of treatment fixed and aspects of inter-community transfers of waste. The first problem compares costs with two schemes of pollution control: (1) where every with has some degree of treatment and (2) where upstream polluters are allowed to discharge as much waste as possible without violating water quality criteria set along the river. The main point made was that the costs of waste treatment increased approximately linearly for treatment range between 30% and 90% BOD removal, thus, there are 2 factors in the costs of water treatment: (1) decrease in costs with increase in size of plant and (2) increase in cost with increase in degree of treatment. Clearly, the economics of scale of waste treatment indicate that a joint treatment plant is more economical for 2 communities, than each having its own plant. It was also shown that the minimum cost solutions can guarantee the same degree of water quality as the equal treatment policy at much less cost. The influence of various parameters, such as river flow, temperature, and formations for inter-community sewer and treatment systems were also investigated. (Lowry-Texas)
W71-09544

TREATMENT OF WASTES FROM FOOD MANUFACTURE AND COFFEE PROCESSING,
Bostok, Hill and Rigby, Birmingham (England).
R. K. Chalmers.
Proceedings, Industrial Waste Conference, 22, Vol 1 II, No 2, July 1968, p 866-878, 1 fig, 4 tab, 4 ref.

Descriptors: *Industrial wastes, Organic wastes, Hydrogen ion concentration, Biochemical oxygen demand, Cost analysis, Evaporation, Separation techniques, Filtration, Centrifugation, Incineration, Screens, Temperature, Foods, *Waste water treatment.
Identifiers: *Food wastes, *Coffee, Custard powders, Jelly products, Dog food, Rice products, Weirs.

When an English General Foods factory was moved from a large city to a small town, it was faced with the need for a means of treating waste, especially from coffee manufacture, which could not be treated in the existing sewage disposal words at the new site, Banbury, Warwickshire. After investigating possible treatment methods, it was decided that physical means of reducing the effluent would be most advantageous. The treatment used was primarily based on segregation of the weak effluent and the strong effluent which contained the waste from the coffee plant. The essential components of the treatment unit are (1) strong and weak effluent collection pits, (2) storage tanks (3) duplicate evaporator feed tanks and a four-stage multiple evaporator for strong liquor treatment, (4) a weak effluent feed tank, duplicate hydro cyclones, pH correction tank, and a weir tank for weak effluent treatment, (5) duplicate centrifuges and two rotary vacuum filters for the grounds press effluents, (6) a paddle mixer, and incinerator boiler for the solids from the centrifuges, and (7) a segregation unit to divide the flow from the extraction columns. The product of the treatment was satisfactorily below the maximums set previously by Banbury authorities. The plant originally cost 220,000 Pounds with an operating costs of 50,000 Pounds per year. (Lowry-Texas)
W71-09545

THE USE OF AERO-HYDRAULIC GUNS IN THE BIOLOGICAL TREATMENT OF ORGANIC WASTES,
Proctor and Redfern, Toronto (Ontario).
C. S. Dutton, and C. P. Fisher.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, March 1966. p 403-423, 7 fig.

Descriptors: *Oxidation lagoons, *Organic wastes, *Oxygenation, Aerobic treatment, Anaerobic conditions, Canneries, Activated sludge, Biochemical oxygen demand, Oxidation-reduction potential, Aquatic algae, *Biological treatment, *Waste water treatment.
Identifiers: Aero-hydraulic gun, Alliston (Ontario).

The aerated lagoon treatment of organic wastes is an economical and increasingly popular process. However, the degree of treatment has been limited by the nature of devices available for accomplishing oxygenation. Recent experiments utilized aero-hydraulic guns in simple aerated lagoons for treatment of organic wastes. The guns consisted of a polyethylene stack pipe, bubble generator, and an air supply that periodically released numerous small bubbles from the lagoon bottom. The resulting flow pattern of liquid from the lagoon bottom involved a strong radial current at the surface. Oxygenation capacity of the guns were derived in a series of curves that plotted lbs O2/hr against free air consumption. Correction factors permitted application of the curves to actual designs. A gun can also function as a positive sludge return pump by sealing up one of the ports and connecting a suction pipe. At a potato waste treatment facility in Alliston, Ontario, some 790,000 gpd of potato waste was discharged daily along with a load of 5,000 lbs BOD and a like amount of suspended solids. Recommendations for this facility were: (1) two conventional settling basins, each 24 ft square equipped with a sludge scraper, (2) a simple aerated lagoon equipped with 127 guns, and (3) two algae lagoons. Dr. C. P. Fisher studied the system and found BOD removal achieved by the aerated lagoon was approximately 90% with little or no measurable residual dissolved oxygen. There was no doubt that the thorough mixing produced by the guns was responsible to a greater or lesser degree for the high removals. Other studies were conducted on poultry and fruit canning wastes. (Burdette-Texas)
W71-09546

THE ISOLATION AND CHARACTERIZATION OF SORBITOL-6-PHOSPHATE DEHYDROGENASE FROM CLOSTRIDIUM PASTEURIANUM,
National Institute for Water Research, Pretoria (South Africa).
P. J. DuToit, and J. P. Kotze.
Biochimica et Biophysica Acta, Vol 206, 1970, p 333-342, 8 fig, 4 tab, 8 ref.

Descriptors: *Enzymes, *Catalysts, *Inhibitors, Kinetics, Oxidation, Equilibrium, Analytical techniques, Laboratory tests, Separation techniques, Centrifugation, Isolation, *Electrophoresis, Hydrogen ion concentration, Chromatography, Spectrophotometry, Waste water treatment.
Identifiers: *Dehydrogenase, Enzyme activity, Buffer.

The procedure for isolating Sorbitol-6-P dehydrogenase included (NH4)2SO4 fractionation, DEAE cellulose chromatography (twice), Biogel P 60 gel filtration, and Sephadex G200 gel filtration. After purification of 176.5-fold, the enzyme carried a negative charge at pH 8.6, and was determined by electrophoretic mobility to consist primarily or one species having a molecular weight between 74,000 and 94,000. The purified enzyme was specific for cofactors NAD.. and NADH, and substrates sorbitol-6-P and fructose-6-P. Otpimum pH values of 8.5 and 10 were determined for the oxidation of sorbitol-6-P in Tris-HCl buffer and in glycine-NaOH buffer respectively. Michaelis-Menten constants Km and inhibitor constants K were determined for all reactants of sorbitol-6-P dehydrogenase. Kinetic constants for sorbitol-6-P and NAD.. had lowed numerical values for Tris-HCl (pH 8.5) than for glycine-NaOH (pH 9.8). The reduced reactants NADH and sorbitol-6-P had Km as well as Ki values, whereas the oxidized reactants, fructose-6-P and NAD.. displayed only Km values, while the Umax values of both reactions were influenced by the concentration of the oxidized reactants. The reaction (fructose-6-P ..NADH sorbitol-6-P ..NAD..) at pH 7.0 had an equilibrium constant of 3.81 x 10 to the 8th power M-1, indicating equilibrium as lying heavily on the side of sorbitol-6-P formation. (Lowry-Texas)
W71-09547

FOOD CANNERY WASTE TREATMENT BY LAGOONS AND DITCHES AT SHEPPARTON, VICTORIA, AUSTRALIA,
Melbourne Water Science Inst. (Australia).
C. D. Parker.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, March 1966, p 284-302, 5 fig, 13 tab, 6 ref.

Descriptors: *Canneries, *Industrial wastes, Peaches, Apricots, Pears, Citrus fruits, Tomatoes, *Aerobic treatment, *Anaerobic digestion, Biochemical oxygen demand, Activated sludge,

Cost comparisons, Sediments, Algae, Hydrogen ion concentration, Electric power, Sewage disposal, *Waste water treatment, *Oxidation lagoons.
Identifiers: Sheppartion (Australia), Oxidation ditches, Soup, Food wastes.

Cannery waste is characterized by high BOD and high acidity. The usual method of treatment is spray or flood irrigation or aerobic type lagoons with heavy dosage of sodium nitrate for odor control. In Shepparton, Victoria, expansions in the facilities of Shepparton Preserving Company, the largest cannery in the Southern Hemisphere, and the building of a soup cannery in the area caused problems in the treatment of the resulting sewage. There was a pressing need for an efficient means of purifying, without causing nuisance, the large seasonal flows of highly polluted food wastes from two canneries on areas closely adjacent to a prosperous and rapidly developing urban center. The short seasonal nature of cannery operations and consequent high capital cost made the problem even more difficult. It was decided to experiment with anaerobic and aerobic type lagoons and oxidation ditches. The waste from each firm is mixed with sewage plant effluent and treated in the new processing unit with very good results which are described in great detail. The total cost of the new unit, excluding the cost of inflow and outflow pipelines and labor and maintainence, was $155,000 to the Preserving Co., and $143,000 (American Dollars) to the soup cannery plus annual costs of $5,364 and $8,192 respectively, excluding pipelines, pumping stations, and maintainence labor. The net result was almost complete purification at costs the industries could accept. (Lowry-Texas)
W71-09548

POLLUTION CONTROL FOR MINING AND PROCESSING OF INDIANA COAL,
Indiana State Board of Health, Indianapolis.
For primary bibliographic entry see Field 05G.
W71-09549

THE EFFECT OF NITROGEN AND PHOSPHOROUS COMPOUNDS ON ONE OF THE MICROORGANISMS RESPONSIBLE FOR SLUDGE BULKING,
Toronto Univ. (Ontario).
Philip H. Jones.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, p 297-315, July 1965, 12 fig, 8 tab, 30 ref.

Descriptors: *Sludge treatment, *Aquatic fungi, Carbohydrates, Molds, *Nitrogen, *Phosphorus, Analytical techniques, Activated sludge, Nutrient requirements, Water pollution sources, Waste water treatment.
Identifiers: *Sludge bulking, Geotrichum candidum, Nitrogen sources.

The term 'sludge bulking' refers to the development of poor settling properties in sludge and is defined as a biophysical response to some upset in the ecological balance of a mixed population of microorganisms. This phenomenon commonly occurs in municipal sewage-treatment plants where sewage which is rich in carbohydrates is found. Since such sewage is usually deficient in nitrogen and phosphorous, a study was undertaken to ascertain whether the microorganisms might actually become dominant due to the indirect effect of increasing BOD/N or BOD/P ratios. Evicence was sought to support the contention that a variety of filamentous microorganisms including Geotrichum candidum are closely associated with the sludge bulking phenomenon. Studies were done on a cross-section of organic and inorganic nitrogen sources when combined with a series of different carbon sources. Tests were also made to show the effect of allowing the concentration of inorganic phosphorous in an otherwise adequate medium. Several different phosphorus ratios were studied. Evidence obtained in these tests showed that in phosphorous or nitrogen deficient wastes, Geotrichum hold a competitive advantage over the microbial population as a whole. (Lowry-Texas)
W71-09550

INDUSTRIAL WASTES FROM SEAFOOD PLANTS IN THE STATE OF ALASKA,
Alaska Department of Health and Welfare, Juneau, Alaska.
Charles L. Jensen.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, p 329-350, 18 fig, 15 ref.

Descriptors: *Industrial waste, *Fisheries, Commercial fishing, Salmon, Crabs, Shrimp, Organic wastes, Alaska, Saline water fish, Chemical reduction, Slurries, Sewage treatment, Waste water treatment, Alaska, Waste disposal.
Identifiers: Kodiac, Fish meal, Sole, Flounder, King crab, Tanner crab, Dungeness crab, *Seafood wastes.

The seafood industry in Alaska is faced with a growing problem due to the huge amounts of waste generated in the processing of seafood. In 1964, waste from salmon was approximately 103 million pounds, king crab waste was 69.5 million pounds, dungeness crab waste was 10 million pounds, shrimp waste was 5.5 million pounds, and halibut waste 3.4 million pounds. The total cost to the processors was $21 million. Changes in the fishing industry have lengthened operation time of processing plants from 50 calendar days to up to 200 days. The conclusion reached on examination of the given data is that (1) Alaska has a potentially dangerous pollution problem, and (2) great amounts of fish waste are being dumped into Alaskan waters which should be of use in the industry which reduces fish waste to meal. A paramount problem is the great distances between primary production points. Possible solutions to the problem include the establishment of a collection system serving the various production centers, necessitating the provision of a storage system to handle the build-up of waste. A variation of the plan calls for primary reduction centers at each of the processing sites. The plan is being studied, and although it has advantages, there are many problems to be worked out. The most probable method would be chemical reduction of the waste to a thick type of slurry, which then could be stored in oil tanks for eventual pumping into the barges or vessels, if the difficulties can be overcome. (Lowry-Texas)
W71-09551

THE APPLICATION OF BACTERIAL PROCESS KINETICS IN STREAM SIMULATION AND STREAM ANALYSIS,
Georgia Inst. of Tech., Atlanta.
For primary bibliographic entry see Field 05G.
W71-09553

LABORATORY AND MATHEMATICAL SIMULATION OF OXYGEN BALANCES EFFECTED IN STREAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 05G.
W71-09554

PRECIPITATION OF PHOSPHATES FROM WATER WITH FERROUS SALTS,
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
Karlis Svanks.
Available from the National Technical Information Service as PB-200 822, $3.00 in paper copy, $0.95 in microfiche. Water Resources Center, Ohio State University, Columbus, Project Completion Report 347X, February, 1971, 150 p, 59 fig, 8 tab, 22 ref. OWRR Project A-011-OHIO (2).

Descriptors: *Phosphate removal, *Phosphates, Dissolved oxygen, *Chemical precipitation, Sedimentation, Flotation, Effluents, Sewage, Activated sludge, *Waste water treatment.
Identifiers: *Ferrous sulfate.

The use of ferrous sulfate for precipitating phosphate from water was investigated. Different phosphate containing solutions were evaluated: (1) pure orthophosphate, (2) secondary effluent from a waste treatment plant, and (3) precipitation of phosphate in a simulated activated sludge process. Determinations were made of the effect of dissolved oxygen concentration, pH, and iron-to-phosphate ratio on the removal of phosphate. The relative effectiveness of calcium hydroxide and sodium hydroxide for control of pH and the use of microflotation and dissolved air flotation for separation of the phosphate precipitate were evaluated. Maximum phosphate removal (up to 97 percent) was obtained when the pH was 7 to 8, the molar iron to phosphate ratio greater than 1.5 and dissolved oxygen concentration equal to that required for complete oxidation of ferrous iron. Calcium hydroxide was found to be a more effective base since the optimal pH range was expanded and the coagulation and flocculation of the insolubilized phosphates were improved. Interferences from organic matter in secondary effluents on flotation operations were observed. Ferrous sulfate should be very effective for removing phosphate in the activated sludge process. The low dissolved oxygen concentration will control the oxidation of ferrous iron to optimal rates, and the sludge will increase the settling rate of the phosphate precipitate.
W71-09555

ADVANCES IN WASTEWATER TREATMENT, PILOT PLANT, POMONA, CALIFORNIA.
Federal Water Quality Administration, Washington, D.C.; and Los Angeles County Sanitation Districts, Los Angeles, Calif.

(1969) 17 p, 14 fig.

Descriptors: *Pilot plants, *Water reuse, *Tertiary treatment, *Waste water treatment, *Sewage treatment, Activated carbon, Ion exchange, Electrodialysis, Reverse osmosis, Denitrification, Adsorption, Nutrients, Nitrogen, Phosphorus, Treatment facilities, California.
Identifiers: *Pomona (Calif), Los Angeles County, Nutrients removal.

The brochure describes the advanced waste treatment facility at Pomona, California, which was funded and staffed through the cooperation of the Federal Water Quality Administration and the County Sanitation Districts of Los Angeles County. The pilot plant receives a portion of the effluent from the conventional biological treatment facilities and investigates processes, and combinations of processes, to improve the quality of the water. The Sanitation Districts are particularly interested in advanced waste treatment processes which will produce reusable water. The plant provides conventional primary sedimentation and activated sludge treatment to approximately 10 mgd of waste water. The final effluent contains 10 mg/l of suspended solids, 5 mg/l of biochemical oxygen demanding materials, 45 mg/l of chemical oxygen demanding materials and 600-700 mg/l of dissolved salts. The initial effort at the pilot plant was directed toward developing technical and economic information on the granular carbon adsorption process for removing the dissolved organic contaminants remaining in the conventionally treated waste waters. In addition to carbon adsorption, the Pomona staff is working on ion exchange, electrodialysis, reverse osmosis, mineral addition to conventional processes to enhance phosphorus removal and biological denitrification. Each of these processes is described and illustrated. Operational efficiencies and costs are given. Removal of phosphorus and nitrogen, and the associated costs are described. (Poertner)
W71-09587

FEASIBILITY STUDY FOR GLENDALE - LOS ANGELES WATER RECLAMATION PLANT.
Engineering Science, Inc., Los Angeles, Calif; and Koebig and Koebig, Inc., Los Angeles, Calif.

March 13, 1969. 720 p, 89 fig, 123 tab, 75 ref.

Descriptors: *Water reuse, *Water pollution treatment, *Waste water, *Waste water treatment, *Water purification, *Beneficial use, *Reclaimed water, Industrial water, Planning, California.
Identifiers: *Los Angeles (Calif), *Glendale (Calif), *Water reclamation plant, *Hyperion Treatment Plant.

Continuing growth of Glendale has resulted in waste water flows which exceed the contractual capacity that Glendale possesses in the City of Los Angeles sewerage system. The cities commissioned a study, in 1968, through a joint powers agreement to investigate the feasibility of constructing a joint water reclamation plant in the Glendale area. This comprehensive and fully documented report presents conclusions that it is necessary, and technically and economically feasible, to build and operate the plant through a joint-powers agreement. The proposed plant, designed for a capacity of 20 mgd in its initial stage, is to be built in 1970. Enlargement of the plant to 35 mgd is proposed for 1987. The final stage, to be completed in 1995, will bring the capacity up to 50 mgd. The plant will be constructed on 15 acres of Glendale property that is currently a community eyesore. Waste water taken from trunk sewers will receive primary and secondary treatment. The reclaimed water will be sparkling clear and will be suitable for use in irrigation, industrial cooling, fire fighting, et cetera. Solid wastes will be removed and put back into the sewer, for processing at the Hyperion Wastewater Treatment Plant. The initial cost is estimated at $5.60 million with the corresponding cost per acre foot estimated between $29 and $32. This unit cost will decrease as the plant capacity is increased, so that by the year 2025 the unit costs of the reclaimed water should be about $19 per acre foot. Federal assistance under Public Law 660 appears promising. (Poertner)
W71-09590

RETENTION BASIN CONTROL OF COMBINED SEWER OVERFLOWS.
Springfield Sanitary District, Springfield, Illinois.
For primary bibliographic entry see Field 05G.
W71-09592

NUTRIENTS AND ALGAL REMOVAL FROM OXIDATION PONDS EFFLUENTS,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 05G.
W71-09629

EFFECTS OF LIMNOLOGICAL FACTORS ON WATER TREATMENT,
Iowa Univ., Iowa City.
For primary bibliographic entry see Field 05F.
W71-09736

GROWING CORN IN GROWTH CHAMBERS WITH DIFFERENT MANURE TREATMENTS,
Kansas State Univ., Manhattan. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W71-09748

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
Raymond C. Loehr.
Journal Water Pollution Control Federation, Vol 43, No 4, p 668-678, 2 fig, 2 tab, 10 ref.

Descriptors: *Farm wastes, *Disposal, *Treatment, *Systems analysis, Runoff, Pollutant, Nutrients, Aerobic treatment, Anaerobic digestion, Dentrification, Nitrification, Effluents, Legal aspects, Waste water treatment, Waste disposal.
Identifiers: Options, Land disposal, Oxidation ditch, Pollutional characteristics alternatives.

The various systems for treating wastes from enclosed confined animal production operations are discussed. There is no one process or waste management system that will be adequate for all animal production operations. Aeration systems such as oxidation ditches are gaining acceptance for waste handling and treatment. It is unlikely that current liquid waste treatment systems for treating concentrated animal waste water will produce effluents that can be discharged to surface water. Land disposal is an integral part of feasible animal waste treatment systems. (Christenbury-Iowa State)
W71-09751

LIVESTOCK WASTE,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
E. Paul Taiganides.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 57-66, 1 tab.

Descriptors: *Farm wastes, *Cattle, Poultry, *By-products, Confinement pens, Water pollution effects, Odor, Organic matter, Moisture content, Runoff, Ammonia, Biochemical oxygen demand, Biological treatment, Drying.
Identifiers: *Animal production, *Coprology, Feedlots, Production efficiency, Waste properties, Population equivalent, Waste transport, Treatment processes.

A short comprehensive review is given of the changes in animal production and waste handling techniques. The transition from pasture to confinement production has met the demand for agricultural food and fiber. There has been a corresponding increase in animal waste management problems. This has given rise to what the author refers to as coprology - manure science. Current coprological technology includes knowledge of manure characteristics, transport methods, waste treatment and utilization schemes, and disposal media. Disposal must be done in such a way and at such a rate that nature will be able to assimilate it without creating environmental problems. (See also W71-09752) (White-Iowa State)
W71-09759

AGRICULTURAL BENEFITS FROM URBAN POLLUTION CONTROL,
Office of the Secretary of the Army, Washington, D.C.
John R. Shaeffer.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 101-107.

Descriptors: *Water pollution control, *Sewage treatment, Sewage, Benefits, Agriculture, Environment, Pollutants, Water pollution effects, Pumping, Viruses, Diseases, Fertilizers, Irrigation, Michigan costs.
Identifiers: *Environmental vision, Waste management, Treatment cells.

An environmental 'vision' is needed which encompasses the fact that the environment is a single interacting closed system, and that pollutants are potential resources out of place. Utilizing these ideas, a pilot waste water management scheme for Muskegon County, Michigan is outlined. Sewage is first pumped to the surrounding countryside where treatment calls convert the waste to an odorless clear liquid by using all the forces of nature - air, aerobic bacteria, gravity, sunlight, and time. The liquid is then used as irrigation water and the soil removes the remaining nutrients, heavy metals, and viruses. An under drainage system picks up the pure water and brings it to a stream. For 42 million gallons of Muskegon County sewage a day, 10 thousand acres of land were needed. The costs for the new system are less than bringing the existing plants up to a secondary level of treatment. (See also W71-09752) (White-Iowa State)
W71-09764

THERMAL DISCHARGES: CHARACTERISTICS AND CHEMICAL TREATMENT OF NATURAL WATERS USED IN POWER PLANTS,
Oak Ridge National Lab., Tenn.
W. L. Marshall.
AGC Contract No. W-7405-eng-26. ORNL-4652, UC-48, UC-80, Reactor Chemistry Division, February, 1971, 12 p. 15 ref.

Descriptors: *Thermal pollution, *Powerplants, Cooling towers, Dissolved oxygen, Corrosion, Scaling, Acidity.
Identifiers: *Thermal discharges, *Chemical treatment, Natural water, Chemical composition.

The purpose of this report is to present information on the constituents of natural waters and the resultant composition of thermal discharges to the environment when these waters are used for cooling thermal powerplants. A weighted mean average of salts in all rivers has been given as 100 mg/liter. The equilibrium solubility of oxygen from an atmospheric mixture of gases at 25C and 1 atm is 8.3 mg per liter of pure water and that of nitrogen is 14.5 mg per liter. In the usual practice for the treatment of once-through water from open rivers or lakes, the gas chlorine is added as biocide about 3 times a day (shock treatment) for approximately a 30 minute period for each addition. Sodium chromate may be added to maintain from 25 to 50 ppm chromate in order to prevent corrosion of condenser surfaces and any other metal parts in the system. The compound ethylenediaminetetraacetic acid (EDTA) has been used to prevent or inhibit scale formation if the water used in cooling towers is sufficiently hard, but the relatively high cost of this substance prohibits its widespread use. Water used in closed cycle primary coolant loops of nuclear reactors should be polished to eliminate those impurities that would become radioactive. This article contains 15 references. (Upadhyaya-Vanderbilt)
W71-09782

5E. Ultimate Disposal of Wastes

POLLUTION OR PROFIT,
Arizona Univ., Tucson. Dept. of Agricultural Chemistry and Soils.
Wallace H. Fuller.
Horticulture, Vol 48, No 12, p 22-23, Dec 1970. 36.

Descriptors: *Water pollution control, Nitrates, Economics, Water reuse, Profit.
Identifiers: *Arizona Agricultural Experiment Station, Gila River, Ben G. Petrucci.

How pollutants can be used to fertilize the soil rather than contaminate water supplies is discussed. Sane disposal, can be profitable to industrialists, agriculturists, homeowners and society as a whole. (Holmes-Rutgers)
W71-09479

RESUME OF SEWERAGE AND REFUSE DISPOSAL PRACTICES OF SANITATION DISTRICTS OF LOS ANGELES COUNTY,
Los Angeles County Sanitation Districts, Los Angeles, Calif.
John D. Parkhurst.
June 1970. 11 p, 6 fig.

Descriptors: *Administration, *Environmental sanitation, *Legislation, *Sewage districts, *Sewage disposal, Sewage treatment, Solid wastes, Outlets, Sewage effluents, Sewage disposal.

Identifiers: *Los Angeles County Sanitation Districts.

The rapid population growth in Southern California following the first World War resulted in overloading sewage treatment facilities, especially in Los Angeles County. In 1923, the state legislature passed the County Sanitation District Act which authorized the board of supervisors of any county to organize a sanitation district with boundaries determined by geographic and topographic drainage areas, without regard to political subdivision. The primary function of such a district is to construct, operate, and maintain facilities to collect, treat and dispose of sewage and industrial wastes. The construction of local sewers and laterals and their connection to the sanitation district's systems remained the responsibility of local authorities. In 1949 the act was amended to authorize districts to provide for the disposal of solid wastes. The major reason for the success of the sanitation districts has been the power to join with other districts to own, construct, maintain, and operate joint facilities. The resume summarizes the operations and organization of the Sanitation Districts of Los Angeles County and the key agreements which have facilitated their administration. Brief descriptions are given of the sewerage systems and outfalls as well as the sewage treatment and waste water reclamation facilities of the Districts. Explanations are given of the Joint Refuse Transfer Disposal System Agreement and the Districts' policies for construction and operation of refuse transfer and disposal facilities in Los Angeles County. (Poertner)
W71-09585

DEEP OCEAN DUMPING OF BALED REFUSE.
For primary bibliographic entry see Field 06E.
W71-09704

INTRODUCTION TO OIL FIELD WATER TECHNOLOGY,
A. G. Ostroff.
Englewood Cliffs, NJ, Prentice-Hall, Inc, 1965, 412 p.

Descriptors: *Oil industry, *Injection wells, *Corrosion brine disposal, *Artificial recharge.
Identifiers: *Water pollution legislation, Water analysis, Water treatment microbiloty, Filtration, Chemical feeders, Boiler and cooling water treatment.

This book provides up-to-date information on oil field water treatment techniques. It covers the chemical, physical, and biological problems encountered with these waters and their causes and correction. Various treatments are presented for injection, disposal, produced, boiler, cooling and plant waters. It deals specifically with water treatment problems encountered in production and includes considerable material on subsurface water injection and treatment. Coverage of sampling and analysis techniques is provided as well as causes of scale, corrosion, and pollution and methods for minimizing these problems. It also details microbiological problems and factors which influence bactericide selection. The book is very well illustrated and referenced. Many of the procedures and concepts are of direct interest to workers in the field of groundwater supply. (Campbell-NWWA)
W71-09721

ALTERNATIVES FOR THE TREATMENT AND DISPOSAL OF ANIMAL WASTES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-09751

1970 REPORT OF THE INTERSTATE SANITATION COMMISSION.
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 05G.
W71-09801

5F. Water Treatment and Quality Alteration

THE ISOLATION AND CHARACTERIZATION OF SORBITOL-6-PHOSPHATE DEHYDROGENASE FROM CLOSTRIDIUM PASTEURIANUM,
National Institute for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 05D.
W71-09547

NEW WATER DISINFECTANT: AN INSOLUBLE QUATERNARY AMMONIUM RESIN-TRIIODIDE COMBINATION THAT RELEASES BACTERICIDE ON DEMAND,
Kansas State Univ., Manhattan. Dept. of Chemistry; and Kansas State Univ., Manhattan. Div. of Microbiology.
S. L. Taylor, L. R. Fina, and J. L. Lambert.
Applied Microbiology, Vol 20, No 5, p 720-722, 1970. 2 tab, 9 ref. OWRR Project A-028-KAN (1).

Descriptors: *Bacteriocides, *Viricides, *Water purification, Anion exchange, Resins, E coli, Coliforms, Pathogenic bacteria, Streptococcus, Salmonella, Pseudomonas, Environmental sanitation, Human diseases, Water pollution effects.
Identifiers: *Triiodide ions, Salmonella typhimurium, Streptococcus fecalis, Staphylococcus aureus, Pseudomonas aeruginosa.

The introduced water disinfectant is a water insoluble compound of basic anion-exchange resins with triiodide ions. This combination proved to possess remarkable antibacterial properties killing 300,000 Escherichia coli cells per ml in a 3.8 g column. The bacteriocidic effect extends to Salmonella typhimurium, Streptococcus faecalis, Staphylococcus aureus, and Pseudomonas aeruginosa. The results were demonstrated by the use of C-14 labeled bacteria. The insolubility and the high capacity of the compound promise its wide application in houses, hospitals, agriculture, and cooling water systems. The exact mechanism of the bacteriocidic effects is being investigated. (Wilde-Wisconsin)
W71-09562

NEW LIFE FOR 'MINI-LAKE ERIES',
Wisconsin Dept. of Natural Resources, Madison.
Thomas L. Wirth.
Wisconsin Conservation Bulletin, Vol 36, No 2, p 7-9, March-April 1971. 3 fig.

Descriptors: *Lakes, *Water quality control, *Project planning, *Economics.
Identifiers: *Upper Great Lakes Regional Commission, Snake Lake, Horseshoe Lake, Lake Marion.

A project being conducted jointly by the University of Wisconsin and the Upper Great Lakes Regional Commission is attempting to demonstrate methods useful for restoration and protection of inland lakes. The article describes three demonstration projects focusing on the physical, economic and original aspects of each project. (Holmes-Rutgers)
W71-09693

EFFECTS OF LIMNOLOGICAL FACTORS ON WATER TREATMENT,
Iowa Univ., Iowa City.
Donald B. McDonald, and Neil B. Fisher.
Available from the National Technical Information Service as PB-201 000, $3.00 in paper copy, $0.95 in microfiche. Completion Report ISWRRI-32, Iowa State Water Resources Research Institute, April 1971, 9 p, 2 tab, 4 ref. OWRR Project A-028-IA (4).

Descriptors: Limnology, *Water treatment, Turbidity, Lignins, Chlorine, Biochemical oxygen demand, Iowa.
Identifiers: Coralville Reservoir, Clear Creek, Threshold odor, Tannis.

Comparisons between previously determined Coralville Reservoir conditions and water plant operations indicate that various limnological conditions are frequently accompanied by specific treatment problems at the University of Iowa Water Treatment Plant. In general, it appears that three periods of high odor values occur annually, during summer and early fall, during late winter and early spring and during early winter. It appears that the operation of the Coralville Reservoir as a flood control structure has a significant effect on limnological conditions within the impoundment and the downstream river. Preliminary comparisons indicate that extended periods of static water level or rapid drawdown may result in increased taste and odor problem at the Water Plant. Laboratory studies were undertaken using a synthesized water and running jar tests to determine what treatment process modifications would be beneficial during critical periods. From experimental runs using five different types of activated carbon it was found that a reduction in the parameters of ammonia, tannin, and taste and odor was accomplished. No other type of carbon was more satisfactory in removing these parameters than the activated carbon normally used in water treatment. Normally used activated carbon gave best removal at 70 ppm. When the water was chlorinated a taste and odor developed that made the water unsatisfactory.
W71-09736

ALTERNATIVE OXYGENATION POSSIBILITIES FOR LARGE POLLUTED RIVERS,
Putgero-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W71-09821

PUBLIC WATER SUPPLY SYSTEMS.
American Water Works Association, New York.
For primary bibliographic entry see Field 03D.
W71-09867

5G. Water Quality Control

POWERS OF CITIES: WATER MANAGEMENT AND POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-09520

A REVIEW OF THE LITERATURE OF 1968 ON WASTEWATER AND WATER POLLUTION CONTROL - INDUSTRIAL WASTE, RADIOACTIVE,
C. P. Straub.
Journal Water Pollution Control Federation, Vol 41, 1223-1251, June 1969.

Descriptors: *Industrial Wastes, *Water, *Control, *Water Quality control, *Water pollution, Water pollution control, Water treatment, Chemical precipitation, Ion exchange, Solvent extractions, Adsorption, Absorption, Electrodialysis, Waste disposal, Oceans, Rivers, Sedimentation, Monitoring, Analytical technique.
Identifiers: Radioactive wastes, Decontamination, Waste management.

The following topics relating to radioactive industrial waste disposal were reviewed (with 167 references): U recovery, waste water treatment by precipitation of radionuclides, solvent extraction, ion exchange, adsorption, uptake on natural materials, electrodialysis, and fixation; ground disposal; disposal in the hydrosphere (oceans, rivers); uptake on sediments; monitoring; and analysis. In the United States increased emphasis is placed on concentrating, solidifying, and containing wastes. Only a nonhazardous, economically irreducible minimum of radioactive material is to be discharged to the environment. Waste management practice at nuclear power plants operates within the limits authorized for release of radioactive wastes to the environment at costs estimated to range between 2 and 10% of their total operating

costs. The average activity in liquid wastes varies from 0.01 to 11.1 Ci, exclusive of 3H. Tritium levels range from 5 to 1300 Ci annually. Use of high-pressure washing and rewashing for leaching U from mined-out areas is referred to. Removal of specific radionuclides by various treatments of waste water is outlined. The presence of detergents affects the treatment of wastes by precipitation; the effect is increased at increased detergent concentrations and generally increases with decreased pH. How 90 Sr is extracted from various radioactive waste solutions at the Hanford B plant is explained. A study to determine if low-cost nuclear energy, heat, radiation, or electricity could be used to reduce the cost of waste water treatment is reviewed. (Houser-NSIC)
W71-09521

THE ANATOMY OF AN IN-TRANSIT SPILL,
Monsanto Co., St. Louis, Mo. Industrial Hygiene and Pollution Control.
Jack T. Garrett.
Journal Water Pollution Control Federation, Vol 43, No 5, May 1971, p 773-778.

Descriptors: *Transportation, *Accidents, *Water pollution control, Neutralization, Biodegradation, Solubility, Toxicity, Hydrogen ion concentration, Sampling, Public health, *Hazards, Water pollution control.

In-transit spills of manufactured products which are being moved overland by truck or train are many times potential contributors to water pollution in the area of the spill. In the past, little notice has been made of this fact, with the primary concern being with the danger of fire, explosion, or direct contact with corrosive materials by individuals in the immediate area. The characteristics needed to evaluate the fire, explosion, or contact danger are generally readily available, whereas the pollutional potential characteristics are not. The characteristics most necessary to evaluate the pollutional potential of a spill are: (1) solubility in water; (2) toxicity to fish and other aquatic life; (3) specific gravity; (4) the effect of neutralizing solvents on the solubility in water, toxicity, and pH of the receiving stream; (5) treatment chemicals, if any, that can reduce the pollution effects; (6) biodegradability; and (7) any other information which may be pertinent. The key to an operation of this type is speed, necessitating development of an information system which will provide ready access to plant officials, pollution control agencies, and law enforcement officials. A small beginning has been made by the National Agricultural Chemists Association, The Manufacturing Chemists Association, and the American Petroleum Institute in working on the problem of information availability for accident use by transportation companies, and local, state, and federal agencies. (Lowry-Texas)
W71-09540

THE OCCURRENCE OF FUNGI IN ACID-MINE DRAINAGE,
Federal Water Pollution Control Administration, Cincinnati, Ohio.
William B. Cooke.
Proceedings, Industrial Waste Conference, 21, Vol L, No 2, Mar 1966, p 258-274, 5 tab, 18 ref.

Descriptors: *Fungi, *Mine drainage, Iron, Hydrogen ion concentration, Laboratory tests, Microbiology, Cultures, Bacteria, Yeasts, Molds, Carbon, Nutrients, Sediment, Habitat, Acclimatization, Tributaries, Summer, Fall, Winter, Water analysis, West Virginia, Ohio, Water pollution control.
Identifiers: Ohio River System.

Problems arising from pollution resulting from acid mine drainage have been recognized in the United States since 1902. The role of fungi in this field has, however, been largely ignored until recently. A new phase of study was begun in 1964 when tributaries of the Ohio River were studied at three points in Ohio and West Virginia which varied in the amount of pollution found. Samples were taken in spring, fall, and winter from the stream bed, the stream, the creek bank at the water level, and the creek bank at a point where water reached the soil only during severe flood conditions. Colonies which resulted in the sample cultures yielded 202 species and species groups. No study of the role of these species in mine-drainage could be made at that time. Studies which were made showed that fungi were exposed to high degrees of acidity and large amounts of iron compounds. Other studies have shown that fungi can readily adapt to a wide variety of habitat factors. Some species are thought possibly helpful in the removal of organic pollutants from water and may at the same time be involved in the production of organically stabilized colloidal iron. True fungi do not seem directly involved in transformations leading to the type of pollution referred to as 'acid-mine drainage' or to be involved in lowering the acidity of their environment. (Lowry-Texas)
W71-09541

THE ECONOMICS OF REGIONAL POLLUTION CONTROL SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Environmental Health.
For primary bibliographic entry see Field 05D.
W71-09544

POLLUTION CONTROL FOR MINING AND PROCESSING OF INDIANA COAL,
Indiana State Board of Health, Indianapolis.
Richard A. Woodley, and Samuel L. Moore.
Proceedings, Industrial Waste Conference, 20, Vol XLIX, No 4, p 265-274, 4 fig, 8 ref.

Descriptors: *Coal mine wastes, *Mine drainage, Strip mine, Underground mining, Land reclamation, Revegetation, Water reuse, Hydrogen ion concentration, Alkalinity, Diversion structures, Excavation, Overburden, Slurries, Sediments, Waste water treatment, Industrial wastes, Indiana.
Identifiers: Coal fines, Clarification ponds, Processing plant.

The Indiana Stream Pollution Control Law of 1943, created the Indiana Stream Pollution Control Board which has control over the pollution of any waters in the state. Indiana mine owners are required to dispose of refuse from processing coal in a manner which will create minimal acid mine drainage and deposits of coal fines. A stream is considered polluted if it has a pH of less than 6.0, alkalinity of less than 50 mg/l and coal fine deposits. Two of the major problems are surface mine drainage control and processing plant pollution control. Underground mine drainage control is also a problem, but is not very serious because of the small number of underground mines in Indiana. Devices such as diversion ditches for surface streams, pumps for conveying precipitation and infiltration from the excavation and deposit of acid producing material in excavations which will be filled with cast overburden are used to prevent pollution of other waters with acid or coal. Flooding, grading to approximate original contour, and revegetation procedures are also used. Care must be taken, too, that coal haulage roads are not made of acid-producing materials. Should this occur, soil or limestone is used to cover the road. Pollution from coal processing is handled by clarification ponds to settle out coal fines in the wash water. Processing refuse is taken to excavations of surface mines and covered. Refuse at underground mines is placed where it can be covered most easily. A closed system in which drainage from the clarification pond and refuse disposal site is combined, treated, and reused for wash water at the processing plant. (Lowry-Texas)
W71-09549

STUDY RELATING TO ENVIRONMENTAL POLLUTION.
For primary bibliographic entry see Field 06E.
W71-09552

THE APPLICATION OF BACTERIAL PROCESS KINETICS IN STREAM SIMULATION AND STREAM ANALYSIS,
Georgia Inst. of Tech., Atlanta.
W. E. Gates, J. T. Marlar, and J. D. Westfield.
Water Research, Vol 3, 1969, p 663-686, 14 fig, 1 tab, 14 ref. OWRR Research Report No A-003-GA (6).

Descriptors: *Hydrogen sulfide, *Foam fractionation, Catalysts, Surfactants, Separation techniques, Oxidation, Filtration, Precipitation (Chemical), Economic feasibility, Technical feasibility, Cost analysis, Water purification, Waste water treatment, Water pollution control.
Identifiers: *Residual.

Three surfactant and surfactant-catalyst systems were studied to determine their feasibility for removal of H2S from sour water, and the recovery of elemental sulfur. The surfactants chosen for study were those known to be capable of forming intermediates in the oxidation in the presence of oxygen, of H2S to sulfur. The surfactants generated a stable foam which was removed and collected. The precipitated sulfur was removed by filtering the foamate. The surfactant was then recycled to the process and re-used. These systems were shown to be capable of reducing the hydrogen sulfide to less than .1 ppm while leaving 40 to 80 ppm of residual surfactant in the effluent. The residual surfactant, since the surfactant used were all biodegradable, presented no hazard to receiving waters, but cost of replacement of the amount lost was excessive. Maximum sulfur recovery was 16% by weight, under the conditions of the investigation. Under the best possible operating conditions (16wt % sulfur recovery and 40 ppm surfactant in effluent), the operating expense was determined to be 3.5 mil/bbl of (200 ppm H2S) sour water treated. (See also W71-09554) (Lowry-Texas)
W71-09553

LABORATORY AND MATHEMATICAL SIMULATION OF OXYGEN BALANCES EFFECTED IN STREAMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
William E. Gates.
Available from the National Technical Information Service as PB-200 821, $3.00 in paper copy, $0.95 in microfiche. Environmental Resources Center, Georgia Institute of Technology, ERC-0171, April 1971. 52 p, 23 fig, 8 ref. OWRR Project A-003-GA (8).

Descriptors: *Stream analysis, *Waste assimilative capacity, *Oxygen sag, *Wager quality control, *Waste water treatment, Dissolved oxygen, Chemical oxygen demand, Bio-Kinetics, Aquatic bacteria, Water pollution effects, Waste management.
Identifiers: *Streeter-Phelps Equation, *Monod Equations.

The project objective was to develop methodology for evaluating and predicting the impact which various parameters and components of waste water have on the dynamic oxygen balance in a receiving water. Dynamic oxygen balances obtained under a variety of oxygenation and deoxygenation conditions were studied in the laboratory using batch reactors and in the field using natural streams. The Streeter-Phelps expression for the mathematical description of oxygen sag curves was found inaccurate due to inclusion of the first order expression for describing substrate utilization by bacteria. Monod Equations were found valid for defining bacterial substrate utilization and protozoa bacterial utilization. Substrate utilization as determined by the COD test was found to be dependent on the time frame for sampling. It was found that the shorter the time frame, the greater the variances and apparent inconsistencies in the data. Techniques were developed for determining Monod Equation constants using batch reactor data and data obtained under continuous dilution in a natural stream. In general, the studies indicate that laboratory evaluation of the impact of alternative methods of water resources management on

the oxygen resources of the receiving stream is valid. (See also W71-09553) (Conway-Georgia Tech)
W71-09554

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-09564

WATER RELATED ENVIRONMENTAL SERVICES.
Central New York Regional Planning and Development Board, Syracuse.
For primary bibliographic entry see Field 06B.
W71-09572

BAY-DELTA WATER QUALITY SUBCOMMITTEE PRELIMINARY REPORT.
Sierra Club, San Francisco, Calif., San Francisco Bay Chapters.
For primary bibliographic entry see Field 06G.
W71-09578

EFFECTS OF PLANNED FRESH WATER DIVERSIONS ON THE SAN FRANCISCO BAY AND SACRAMENT—SAN JOAQUIN ESTUARY,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06G.
W71-09581

STATEMENT OF THE BOARD OF SUPERVISORS OF CONTRA COSTA COUNTY, REGARDING EFFECT OF REDUCED OUTFLOW UPON THE SAN FRANCISCO BAY-SACRAMENTO-SAN JOAQUIN DELTA ESTUARINE SYSTEM.
Board of Supervisors of Contra Costa County, Martinez, Calif.
For primary bibliographic entry see Field 06G.
W71-09584

RETENTION BASIN CONTROL OF COMBINED SEWER OVERFLOWS.
Springfield Sanitary District, Springfield, Illinois.

Copy available from GPO Sup Doc as , $1.00; microfiche from NTIS as PB-200 828, $0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series 11023---08/70, August 1970. 97 p, 37 fig, 4 tab, 8 ref. EPA-WQO Grant 3-111-1.

Descriptors: *Water pollution control, *Settling basins, *Surface runoff, *Storm runoff, *Waste water disposal, Drainage water, Stream improvement, Fishkill.
Identifiers: *Combined sewer overflows, *Retention basins.

The Springfield Sanitary District constructed a 10 acre basin to collect and detain combined sewer overflows that bypass the Cook Street Pumping Station during periods of high volume flow. Surface runoff accompanying rainstorms cause high volume flows which are diverted into the Cook Street Channel. Such flows introduce highly toxic pollution loads into Sugar Creek and the South Fork of the Sangamon River. The retention basin was built to intercept these flows so that they could be stored temporarily and released at low flow rates into Sugar Creek to avoid shock pollution of the stream. Historically, the high concentrations of pollutants discharged into Sugar Creek have caused serious fishkill. The retention basin was designed to retain water to a depth of four feet before it discharges captured runoff through a spillway provided with a notched weir. Average annual reduction of BOD was 27 percent and coliform reduction averaged 72 percent. However during the period from June through October 1969, production of algae in the basin caused the effluent BOD to consistently exceed that of the influent. In addition to the oxygen demand on the stream, production of algae may be objectionable at some installations for aesthetic reasons. Sludge accumulation was significant in the basin and must be taken into account in design of similar facilities. Suggestions for future designs of retention basins are included. (Poertner)
W71-09592

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1971.
Mississippi State Univ., State College. Water Resources Research Inst.

Available from the National Technical Information Service as PB-200 829, $3.00 in paper copy, $0.95 in microfiche. Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, 1971. 80 p. OWRR Project A-999-MISS (7).

Descriptors: *Water resources development, *Mississippi, *Conferences, *Water resources research act, Reservoirs, Water quality, Monitoring, Navigation, Waste water treatment, Water management (Applied).
Identifiers: *Mississippi Water Resources Conference (1971).

The sixth Mississippi Water Resources Conference was held in Vicksburg on 13-14 April for the purpose of exchanging information pertaining to water resources. Topics discussed include nutrients and algal removal from oxidation ponds effluents, chlorinated hydrocarbon insecticide contamination of streambed sediments in the Mississippi River delta, effects of turbidity on forest recreation potentials, economic determinants for sediment management on a north Mississippi watershed, water management implications in the south's third forest, restoration and development of the port of gulfport, establishment of an automatic water quality surveillance program, and water resource problems and opportunities associated with multiple-purpose impoundments. (See also W71-09629 thru W71-09634) (Knapp-USGS)
W71-09628

NUTRIENTS AND ALGAL REMOVAL FROM OXIDATION PONDS EFFLUENTS,
Mississippi State Univ., State College. Dept. of Sanitary Engineering.
Adnan Shindala.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 1-7, 1971. 7 p, 1 fig, 1 tab, 3 ref.

Descriptors: *Algae, *Waste water treatment, *Tertiary treatment, *Coagulation, *Oxidation lagoons, Aerobic treatment, Oxidation, Organic matter.
Identifiers: Nutrient removal.

Chemical coagulation is an effective post treatment process for algal removal and for improving the quality of effluents from stabilization ponds. Of the coagulants tested, alum was the best. The optimum dosage for best removal of the parameters studied was in the range of 75 to 100 mg/liter. Using this dosage, the supernatant from the chemical coagulation process was found to contain 2.5 mg/liter BOD, 22.9 mg/liter COD, 1.5 mg/liter total phosphates, 3.5 mg/liter total phosphates, 3.5 mg/liter total nitrogen, 500 to 1000 algal cells/ml and approximately 5,000 coliforms/100 ml. The algae in the pond effluents contribute heavily to the BOD, COD, and nitrogen in the effluent, while the contribution to the phosphates concentration was less important. (See also W71-09628) (Knapp-USGS)
W71-09629

CHLORINATED HYDROCARBON INSECTICIDE CONTAMINATION OF STREAMBED SEDIMENTS IN THE MISSISSIPPI RIVER DELTA,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
L. L. McDowell, E. H. Grissinger, G. C. Bolton, D. A. Parsons, and W. F. Barthel.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 9-21, 1971. 13 p, 5 fig, 2 tab, 3 ref.

Descriptors: *Mississippi, *Path of pollutants, *Chlorinated hydrocarbon pesticides, *Mississippi River, *Bottom sediments, Water pollution sources, Farm wastes, Industrial wastes.
Identifiers: *Mississippi Delta.

The large amounts of chlorinated hydrocarbon insecticides previously applied to crops in the Mississippi River Delta have not created widespread chronic contamination of the streambed sediment in the Mississippi River (detectable at 0.01 ppm). On the tributaries, with one exception, DDT analogs and metabolites were the only residue originating from agricultural or urban sources. Significant contamination resulted from manufacturing operations in the Wolf River-Cypress Creek complex at Memphis, Tenn., and from a group of pesticide formulating plants in Mississippi. Concentrations of individual pesticides ranged from non-detectable to 24,000 ppm. (See also W71-09628) (Knapp-USGS)
W71-09630

EFFECTS OF TURBIDITY ON FOREST RECREATION POTENTIALS,
Forest Service (USDA), Jackson, Miss.
Robert J. Lentz.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 23-28, 1971. 6 p, 2 tab, 9 ref.

Descriptors: *Water quality, *Recreation, *Turbidity, *Planning, Swimming, Fishing, Boating, Water pollution sources, Water pollution effects, Erosion, Erosion control, Forests.
Identifiers: Forest recreation.

Clear water is essential for a quality recreation experience and is highly desirable from the standpoint of visual appeal, recreation enjoyment, and safety. Recreational development plans must consider environmental influences and be flexible to compensate for unforseen contingencies. Turbidity has a detrimental physiological and psychological effect on recreation users, and users affect water quality. Proper planning is essential to insure the best type of environment for a quality recreation experience. (See also W71-09628) (Knapp-USGS)
W71-09631

ECONOMIC DETERMINANTS FOR SEDIMENT MANAGEMENT ON A NORTH MISSISSIPPI WATERSHED,
Economic Research Service, Oxford, Miss. Natural Resource Economics Div.
Harold R. Cosper.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 29-40, 1971. 12 p, 1 fig, 4 tab.

Descriptors: *Sediment control, *Cost-benefit analysis, *Economics, *Mississippi, Forest management, Channel improvement, Check structures, Dam construction, Silting, Soil erosion, Erosion control.
Identifiers: Pigeon Roost Creek (Miss).

Studies pertaining to economic and physical relationships within a watershed acre conducted on a 117-square-mile section of the Pigeon Roost Creek Watershed in North Mississippi. The principal emphasis for management and control of sediment in the Pigeon Roost Creek Watershed of North Mississippi was on retaining the sediment on the watershed. This was done by artificial barriers to trap and retain the sediment, and land use change

to reduce and prevent further soil losses off the watershed. The necessary economic determinants required to assess economic efficiency include not only the direct capital investments but also any economic adjustments in the farming enterprise. Average total direct capital cost was $8.95 per watershed acre for the 74,900 acres. Sediment-retarding structures accounted for $4.61 per acre, and the reforestation program for $4.34. The increase in forested acres was not an economic cost because this land had previously been idle. Also, there were no economic adjustments made on cultivated lands to specifically accommodate sediment management. (See also W71-09628) (Knapp-USGS)
W71-09632

WATER RESOURCES PROBLEMS AND OPPORTUNITIES ASSOCIATED WITH MULTIPLE-PURPOSE IMPOUNDMENTS,
John P. Burt.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 75-80, 1971. 6 p.

Descriptors: *Water resources development, *Water quality, *Planning, *Water quality control, *Mississippi, Reviews, Water storage, Multiple-purpose reservoirs.

Some of the problems associated with developing impoundments for water supply and recreational water contact sports in addition to other water use purposes are reviewed. The criteria for these two purposes are more stringent than for other water use purposes and were used to illustrate the water resources problems. Usually, no water quality criteria problems are associated with purposes of flood storage, storage for flow augmentation or irrigation unless unusual circumstances exist in the drainage area. (See also W71-09628) (Knapp-USGS)
W71-09633

ESTABLISHMENT OF AN AUTOMATIC WATER QUALITY SURVEILLANCE PROGRAM,
Corps of Engineers, Mobile, Ala. Environmental Quality Section.
Nathaniel D. McClure, IV.
Conference held April 13-14, 1971, Vicksburg, Water Resources Research Institute, Mississippi State University, p 67-74, 1971. 8 p, 13 ref.

Descriptors: *Water quality, *Monitoring, *Mississippi, *Water resources development, Dissolved oxygen, Water temperature, Hydrogen ion concentration, Electrical conductance, Turbidity, Reservoirs, Canals.
Identifiers: *Water quality monitoring.

In an attempt to obtain information about the effect existing water resource developments in Mississippi and Alabama have on water quality, an Automatic Water Quality Surveillance Program was developed. The basic component of this program is the continuous water quality monitor. Five parameters are monitored: temperature, dissolved oxygen, pH, specific conductivity and turbidity. A paper tape punch was chosen for data recording because of its capability of directly interfacing with automatic data processing techniques. A computer program was developed to reduce the data to a more interpretable form. The weekly checkout of the remote station involves cleaning of the sample chamber, examining all sensors, adding of electrolyte to the D.O. and pH probes as necessary and a calibration check of three parameters. (See also W71-09628) (Knapp-USGS)
W71-09634

UNITED STATES V VULCAN MATERIALS CO (POLLUTION PROSECUTION UNDER THE NEW YORK HARBOR ACT).
For primary bibliographic entry see Field 06E.
W71-09660

ESTABLISHING THE ENVIRONMENTAL QUALITY COUNCIL AND THE CITIZENS ADVISORY COMMITTEE ON ENVIRONMENTAL QUALITY,
For primary bibliographic entry see Field 06E.
W71-09663

SEWDISH SCIENCE: SAYING WHAT SHOULD BE DONE,
Lund Univ. (Sweden).
Andrew Jamison.
Technology Review, Vol 73, No 6, p 12 and 13, April 1971.

Descriptors: *Water pollution control, *Lake restoration, Economic feasibility, Decision-making.
Identifiers: *Sweden, Lake HornBorga, Lake Trummen, Vaxjo.

Swedish limnologists have begun to work directly with industry and government to restore polluted lakes. The lake restoration projects mentioned in this article are examples of scientists promoting change and proposing pollution control schemes to affect environmental improvement. The author questions whether these examples are more than unique and will actually serve as a model for scientific contributions to the environmental policy in Sweden. (Holmes-Rutgers)
W71-09686

HOW SWEDEN TACKLES POLLUTION,
Lund Univ. (Sweden).
Andrew Jamison.
New Scientist and Science Journal, Vol 49, No 737, p 234-236, Feb 4, 1971.

Descriptors: *Water pollution control, *Policy planning, *Lake restoration, Industrial water.
Identifiers: *Sweden, Royal Swedish Environmental Protection Board, Lake Trumman.

Sweden has developed an efficient system for dealing with environmental pollution as illustrated in this article with examples of water pollution control. However, some Swedish scientists advocate a more comprehensive effort at planning in an ecological way for the future development of the country, instead of tackling each pollution crisis as it occurs. (Holmes-Rutgers)
W71-09687

INTERSTATE SANITATION COMMISSION--POWERS.
For primary bibliographic entry see Field 06E.
W71-09688

USE OF CHEMICALS, MATERIALS OR TECHNIQUES TO TREAT OIL SPILLS (MASSACHUSETTS POLICY STATEMENT).
Massachusetts Div. of Water Pollution Control, Boston.
For primary bibliographic entry see Field 06E.
W71-09689

SOLID STATE BREAKTHROUGHS IN WATER AND WASTE CONCEPTS,
Autocon Industries, St. Paul, Minn.
R. W. Brown.
Journal of the New England Water Works Association, Vol 84, No 3, p 253-261, Sept 1970. 5 fig.

Descriptors: *Water pollution control, Comparative costs, *Water treatment, *Waterworks.
Identifiers: *Autocon Auto-Mod system.

This article describes the usefulness of solid state components in water and water treatment systems. These components provide reliability, flexibility, serviceability, and the ability to design systems for maximum utilization for the minimum investment. (Holmes-Rutgers)
W71-09691

AD VALOREM TAX EXEMPTION FOR ANTI-POLLUTION DEVICES, SYSTEMS AND FACILITIES.
For primary bibliographic entry see Field 06E.
W71-09692

STATE CERTIFICATION OF ACTIVITIES REQUIRING FEDERAL LICENSE OR PERMIT.
For primary bibliographic entry see Field 06E.
W71-09698

CERTIFICATION OF FACILITIES FOR WATER POLLUTION CONTROL.
For primary bibliographic entry see Field 06E.
W71-09699

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-09701

A BILL TO CONSENT TO THE INTERSTATE ENVIRONMENT COMPACT.
For primary bibliographic entry see Field 06E.
W71-09702

GREAT LAKES BASIN CONSERVATION ACT (A BILL TO AMEND THE SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT TO PROVIDE FOR A GREAT LAKES BASIN CONSERVATION PROGRAM).
For primary bibliographic entry see Field 06E.
W71-09703

STATE CERTIFICATION OF ACTIVITIES REQUIRING A FEDERAL LICENSE OR PERMIT.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-09705

CLEAN WATERS FOR AMERICA WEEK, 1971,
For primary bibliographic entry see Field 06E.
W71-09706

BASS ANGLER SPORTSMAN SOC'Y V UNITED STATES STEEL CORP (PRIVATE PARTY LACKS RIGHT TO ENFORCE ANTI-POLLUTION PROVISIONS OF RIVERS AND HARBORS ACT).
For primary bibliographic entry see Field 06E.
W71-09707

TOWARD A CONSTITUTIONALLY PROTECTED ENVIRONMENT.
For primary bibliographic entry see Field 06E.
W71-09709

STOCHASTIC POPULATION DYNAMICS FOR REGIONAL WATER SUPPLY AND WASTE MANAGEMENT DECISION-MAKING,
Massachusetts Univ., Amherst.
Peter Meier.
Water Resources Research, Technical Report No EVE 25-70-5, August 1970. 207 p, 37 fig, 22 tab, 105 ref, 5 append. OWRR Project B-011-MASS (4).

Descriptors: *Regional analysis, *Water management, *Input-output analysis, *Population, Dynamics stochastic processes, Optimization.

A methodology for local area population projection and water and sewer service area prediction was developed. The projection model consisted of a stochastic simulation of interregional population growth and a finite-difference solution to a non-

linear differential equation describing spatial variations in urban population densities. The projection model output was designed as input to optimization algorithms for region-water supply and waste treatment facilities. The components of demographic change were modeled as autoregressive stochastic processes, and a response surface algorithm was developed to decompose net migration rates into in- and outmigration rates. Service area prediction was based on a computerized evaluation of the distance-density relations at the existing service area periphery. Comparison of results to preliminary 1970 census figures indicated a superior prediction performance over traditional methods of population projection as practiced by consulting engineers and planners. (Veverka-Cornell)
W71-09741

MANAGEMENT OF WATER QUALITY IN RELEASES FROM SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
For primary bibliographic entry see Field 04A.
W71-09742

SELECTIVE WITHDRAWAL AS A WATER QUALITY MANAGEMENT TOOL FOR SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
For primary bibliographic entry see Field 04A.
W71-09743

REGULATIONS PERTAINING TO ISSUANCE OF A PERMIT.
Missouri Water Pollution Board.
For primary bibliographic entry see Field 06E.
W71-09744

A DOSING SIPHON FOR DISCHARGING CLEANING WATER INTO FLUSHING GUTTERS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
H. L. Person, and J. R. Miner.
Unpublished paper presented at the 1971 Mid-Central Region Meeting American Society of Agricultural Engineers. Paper No MC-71-105, 22 p, 10 fig, 3 ref.

Descriptors: *Farm wastes, Design data, Equipment, Confinement pens, Test procedures, Theoretical analysis, Water pollution control.
Identifiers: *Flushing gutter, *Dosing siphon, Waste removal, Snifter.

An automatic dosing siphon has been designed, built, and used for discharging water into flushing gutters. An explanation of how the device operates as well as test data and design information are presented. The automatic dosing siphon is easy to design and build. The parts are commercially available. If proper precautions are taken to ensure that all joints are airtight, the automatic dosing siphon is a dependable device for discharging cleaning water into flushing gutters. (Christenburg-Iowa State)
W71-09747

ECONOMICS OF POLLUTION CONTROL,
Iowa State Univ., Ames. Dept. of Economics.
John F. Timmons.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 77-85.

Descriptors: *Environment, *Water pollution control, Economics, Natural resources, Standards, Programs, Costs, Benefits, Watersheds, Agriculture, Water pollution effects.
Identifiers: *Environmental quality, Goals, Quality standard, Suspended sediment, Production costs.

The paper suggests some ideas and methods that appear useful in understanding and in resolving some of the difficult but important issues emanating from three environmental quality questions. First, what are the standards of environmental quality that can serve as policy and program goals and at the same time engender wide spread and continuing public understanding and support. Next, what are the costs, both monetized and non-monetized, of both achieving and failure to achieve the stated standards of environmental quality. Thirdly, who pays the costs both with and without achievement of the standards of environmental quality and who gets the benefits. Since environmental quality is a national issue, the author has endeavored to identify and elaborate upon these three major considerations in our quest for improvements in the quality of the natural environment. (See also W71-09752) (White-Iowa State)
W71-09761

CURRENT CONSERVANCY LEGISLATION,
Iowa House of Representatives, Des Moines.
Dale M. Cochran.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 87-93.

Descriptors: *Soil conservation, *Legislation, Wind erosion, Drainage, Soil erosion, Water pollution effects, Sediment, Rivers, Fertilizers, Pesticides, Agriculture, Iowa.
Identifiers: *Conservancy Districts, Des Moines River, District soil commissioners, Non-farm sources, US Department of Agriculture.

The scope and content of Iowa's Conservancy District bill is explained in this paper. The bill resulted after a review and study of drainage laws indicated that flood control, water pollution, recreation, soil erosion, and others were closely related. Conservation efforts have become rather static for a number of reasons, among them apathy, large operators, and shifts to continuous row crops. The Conservancy bill, as proposed, would regulate farm and non-farm sources of erosion both by wind and water. The local soil conservation district commissioners would be in charge of soil conservation compliance. Cost sharing would be available for those required to comply. Failure to comply could result in a court order requiring immediate compliance and loss of any cost sharing funds that might have been available. (See also W71-09752) (White-Iowa State)
W71-09762

POLLUTION CONTROL DECISIONS - WHO SHOULD MAKE THEM,
Resources for the Future, Inc., Washington, D.C.
Edwin T. Haefele.
In: 33rd Annual Forum, National Farm Institute, February 1971, Des Moines, Iowa, p 95-99.

Descriptors: *Water pollution control, *Pollution abatement, Governments, Legislation, Environment, Taxes, Water pollution effects, *Decision making.
Identifiers: Individual rights, Executive responsibility.

Four lessons have been learned in the developing history of our country to the problems of pollution control. The first lesson is the necessity for legislative determination of policy. Most environmental issues are not problems that can be solved but conflicts that must be resolved. Individual rights is the second lesson. All of us are exercising our individual rights to the detriment of all of us. Rightfull use by each individual is the central core of the problem of over use of common property resources. The need for executive responsibility is the third lesson. The fourth lesson involves connecting the notion of individual right with that of personal interest through the use of taxation and prices as regulatory devices. (See also W71-09752) (White-Iowa State)
W71-09763

BASIC DATA ON HEAT DISSIPATION DOWNSTREAM FROM LARGE HEAT SOURCES,
Geological Survey, Washington, D.C.
A. P. Jackman, and E. L. Meyer.
In: Fifth Annual Health Physics Society Midyear Tropical Symposium, Health Physics Aspects of Nuclear Facility Siting, Vol. 3, p. 748-763, November 3-6, 1970. Idaho Falls, Idaho, 8 fig.

Descriptors: *Thermal pollution, *Thermal powerplants, Temperature, Meteorological data, Convection, Sites, Stream flow, Mass transfer, Water pollution control.
Identifiers: *Thermal discharge, *Heat dissipation, Heat flux.

The heat dissipation has been measured downstream from 7 large heat sources on rivers in the United States by the United States Geological Survey in cooperation with the United States Atomic Energy Commission. The purpose of the measurements was to provide basic reference data for the planning and design of thermal electric power stations and for verification of theoretical models of heat dissipation in streams. The data were collected during intensive 24-hour surveys repeated up to three times during one year at each site. Stream temperature and discharge data in great detail were obtained at several cross sections in reaches extending up to 31 km downstream from the heat source; selected meteorologic data were also collected within each reach. Even in the longest reaches more than 60 percent of the added heat was observed in the river at the downstream end of the reach. These observations are consistent with a theoretical evaluation of the heat dissipation based on the Stefan-Boltzmann equation, Harbeck's mass transfer approximation of evaporative heat flux, and the Bowen ratio. Heat losses observed varied greatly and include an episode when practically no loss of heat was observed for six hours in a 10-mile reach despite water temperatures 10C higher than air temperatures, probably due to a dense fog confined to the stream channel. (Upadhyaya-Vanderbilt)
W71-09765

NAVIGABLE WATERS POLLUTION CONTROL ACT OF 1965 (A BILL TO PROVIDE FOR THE ESTABLISHMENT OF REGULATIONS FOR THE PURPOSE OF CONTROLLING POLLUTION FROM VESSELS AND OTHER SOURCES IN THE NAVIGABLE WATERS OF THE UNITED STATES).
For primary bibliographic entry see Field 06E.
W71-09766

CHLORINE MAKERS CLUTCH AT LAST DROPS OF MERCURY.

Chemical Week, Vol. 108, No. 8, p. 75-77, February 24, 1971.

Descriptors: *Heavy metals, Water pollution control, Pollution abatement.
Identifiers: *Mercury, *Chlorine industry, *Mercury recover.

The problems of stopping mercury losses are complex. In general, mercury leaves the mercury cells of a chlorine plant primarily in the hydrogen, caustic and chlorine streams. It is also found in the cell outlet brine, filter, various wastewater and condensate streams. At least one plant is using ferrous chloride, instead of inorganic sulfides, for precipitation, which results in the range of 100-300 ppb of mercury in the effluent. Other methods of reducing mercury contents in the effluent are mentioned such as Bayer's method which, with the use of carbon, reduces mercury concentration to 0.01 mg/m3, or Ventron's method of precipitating metallic mcerucy. N.J. Zinc has demonstrated the application of zinc dust for dramatic reduction of mercury in wastewaters. (Oleszkiewicz-Vanderbilt)
W71-09783

A BILL TO AMEND THE INTERNAL REVENUE CODE OF 1954 TO ENCOURAGE THE ABATEMENT OF WATER AND AIR POLLUTION BY PERMITTING AMORTIZATION OF THE COST OF ABATEMENT WORKS.
For primary bibliographic entry see Field 06E.
W71-09785

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT IN ORDER TO ESTABLISH A PROGRAM TO DECREASE WATER POLLUTION BY SYNTHETIC DETERGENTS.
For primary bibliographic entry see Field 06E.
W71-09786

EVALUATING OIL SPILL CLEANUP AGENTS. DEVELOPMENT OF TESTING PROCEDURES AND CRITERIA,
California State Water Resources Control Board, Sacremento.
Charles R. Hazel, Fred Kopperdahl, Norman Morgan, and Walter Thomsen.
California Water Resources Control Board Publication No. 43, July 6, 1970, 150 p, 67 fig, 17 tab, 100 ref.

Descriptors: *Oil wastes, *Cleaning, *Dispersion, *Chemicals, *Surfactants, *Toxicity, *Bioassay, Fish, Shellfish, Algae, Degradation.
Identifiers: *Dispersants, *Collecting agents, *Sinking agents, Effectiveness, Testing procedures, Criteria, Classifications.

Criteria for licensing and regulating the use of oil spill cleanup agents was studied and developed. Criteria included toxicity, performance effectiveness and physical-chemical descriptions of the OSCA. Bioassays were performed to establish 96-hour TLM values for dispersants, oil and combinations of oil and dispersants. Biodegradation of dispersants was tested by BOD, foam calibration and toxicity decay bioassay. Miscibility with seawater, percent of oil emulsified, oil sinking and dispersion after several hours were the criteria for performance effectiveness tests. Feasibility of 'fingerprinting' dispersants were tested quantitatively. Licensing criteria and test procedures for product flash point, P.H, trace substances and occupational health hazards were determined. (Ensign-PAI)
W71-09789

ESCAROSA: A PRELIMINARY STUDY OF COASTAL ZONE MANAGEMENT PROBLEMS AND OPPORTUNITIES IN ESCAMBIA AND SANTA ROSA COUNTIES, FLORIDA.
Florida Coastal Coordinating Council, Tallahassee.
For primary bibliographic entry see Field 02L.
W71-09794

1970 REPORT OF THE INTERSTATE SANITATION COMMISSION.
Interstate Sanitation Commission, New York.

Report of the Interstate Sanitation Commission on the Water Pollution Control Activities and the Interstate Air Pollution Program, 1970, 69 p.

Descriptors: *Water pollution control, *Waste water disposal, *Water analysis, *Biochemical oxygen demand, *Treatment facilities, Nutrients, Coliforms, Air pollution, New York, New Jersey, Connecticut.

A record of the water and air pollution activities of the Interstate Sanitation Commission and the work and planning on water pollution control projects within the Interstate Sanitation District are reported for 1970. Planning and construction provided for a minimum of 80% BOD removal to waste water effluents discharged into District waters. Ability to conduct additional analyses which enabled the commission to act as a regional laboratory for state and federal agencies was expanded. A training program for treatment plant operators was continued. Dissolved oxygen and coliform density showed an increase since the last report. The Commissions responsibilities and programs for air pollution are also reported. (Ensign-PAI)
W71-09801

ALTERNATIVE OXYGENATION POSSIBLITIES FOR LARGE POLLUTED RIVERS,
Putgero-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
William Whipple, Jr., and Shaw L. Yu.
Water Resources Research, Vol 7, No 3, p 566-579, June 1971. 14 p, 12 fig, 1 tab, 23 ref. EPA - Water Quality Office Project 16080 DUP.

Descriptors: *Water pollution treatment, *Aeration, *Oxygenation, *Delaware River, *Estuaries, Reaeration, Application equipment, Cost-benefit analysis, Sewage treatment, Stream improvement.
Identifiers: Delaware Estuary.

The idea of induced aeration of polluted rivers is gaining acceptance, prototype equipment having been installed on the Miami River in Ohio and on the Ruhr River in Germany. Aeration is feasible and in use on some small rivers. This paper describes tests of aeration equipment on a major river, the Delaware Estuary, and discusses transfer efficiency, suitable aerator system design, and cost comparisons. Navigational considerations and deeper, more turbulent water cause design requirements for large rivers to differ considerably from the requirements for small rivers. Reinforced aerators at the surface appear favorable for uncrowded river areas, but air diffusers on the bottom appear more practicable and comparably economical for port areas. Diffusers can be placed only on channel margins and anchorage areas, but dispersion studies indicate that the oxygenated water will still reach the center of the river within a reasonable distance. The cost of adding one unit of dissolved oxygen by aeration devices appears to be just about one-fourth that of adding it by waste treatment only. There are possibilities of lowering costs further by using oxygen diffusers. (Knapp-USGS)
W71-09821

GUNDY V VILLAGE OF MERRILL (CITY'S RESPONSIBILITY FOR NUISANCE CREATED BY OPEN DRAINAGE OF SEWAGE).
For primary bibliographic entry see Field 06E.
W71-09869

PANGLOSS ON POLLUTION,
London School of Economics and Political Sciences (England).
E. J. Mishan.
Swedish Journal of Economics, Vol 73, No 1, March 1971, p 113-120.

Descriptors: *Pollution, Resource allocation, Risk, Welfare economics, Effluents, Water pollution control.
Identifiers: *Transaction costs, Equity, Spillover problem, Subsidy, Frictional cost, External diseconomy.

The view is considered that pollution above a theoretical optimum is justifiable economically as long as the transaction costs of correcting the suboptimal position exceed the optimality gains. Because of welfare effects and the magnitude of transaction costs, the overall optimal outputs of polluting activities under pollution permitting laws can be much greater than under optimal outputs under pollution prohibiting laws. For environmental pollution, the case for a change to anti-pollution laws rests mainly on equity and allocative merit with particular attention paid to the external diseconomies of increasing risk from adverse spillovers for future generations. This paper is of interest to water research concerned with pollution control. (Siegenthaler-Rutgers)
W71-09877

MODELS FOR INVESTIGATION OF INDUSTRIAL RESPONSE TO RESIDUALS MANAGEMENT ACTIONS,
Resources for the Future, Inc., Washington, D.C.
Clifford S. Russell.
The Swedish Journal of Economics, Vol 73, No 1, March 1971, p 134-156.

Descriptors: *Residuals management, Decision-making, Sewage treatment linear programming, Prices, Sensitivity analysis, Water pollution control.
Identifiers: *Cost of discharge, Objective function, Algorithm, End-of-pipe treatment.

It is argued that, for purposes of residuals management decisions, it is necessary to go beyond models that stress end-of-pipe treatment and a single receiving medium. Doubts are presented concerning the cost-of-discharge-reduction approach because it ignores the laws of conservation of energy and mass. The model used to investigate industrial response to residuals management policies reflects both the interconnections between residual forms and discharge media implied by the conservation of mass and energy and the opportunities available for the reduction of residuals generation in production. A description of the firm's decision-making process concerning residuals discharges is given and then modified to a form solvable by linear programming algorithms. An example is presented of the application of the linear residuals response model to the petroleum industry. The use of models of industrial response to residual management action for regional residuals management is considered. (Siegenthaler-Rutgers)
W71-09878

A METHOD OF ESTIMATING SOCIAL BENEFITS FROM POLLUTION CONTROL,
Handelshogskolan i Stockholm (Sewden).
Karl-Goran Maler.
The Swedish Journal of Economics, Vol 73, No 1, March 1971, p 121-133.

Descriptors: *Pollution control, Recreation, Demand function marginal cost, Marginal utility.
Identifiers: *Willingness to pay, Social benefits, Pareto optimality, Public good, Consumer surplus, Opportunity cost.

An approach to the estimation of social benefits from water pollution control is presented. A theoretical framework is developed which enables derivation of the willingness to pay for public goods on the basis of information on demand functions for private goods. The marginal willingness to pay or the demand price for the public good can be estimated by estimating the expenditure function as a function of public goods supplied. An example is given illustrating the technique of deriving the expenditure function. The theorems on uniqueness of solutions to differential equations show that the expenditure function ultimately derived is the correct one. (Siegenthaler-Rutgers)
W71-09881

SHELBY LOAN AND TRUST CO V WHITE STAR REFINING CO (LIABILITY FOR POLLUTION OF LAKE).
For primary bibliographic entry see Field 06E.
W71-09882

BACKGROUND FOR THE ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION,
Resources for the Future, Washington, D.C.
Allen V. Kneese.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 1-24.

Descriptors: *Economic analysis, *Environmental quality, *Air pollution, *Water pollution, *Technology, Regional analysis, Wastes, Taxes, Investment, Population, Reservoirs, Sewage, Rivers, Transportation.

Identifiers: *Residuals, Production, Consumption, External diseconomies, Materials balance, Recycling.

The scientific and technological aspects of environmental problems are discussed in order to complement and complete the economic approach to these difficulties. Global and regional effects of environmental pollution are presented individually, then tied together in a 'materials balance' approach. In the discussion of the global effects of pollution, meteorological, hydrological and atmospheric difficulties are analyzed, including changes in carbon dioxide, waste energy rejection into the atmosphere, and toxic agents in coastal waters and oceans. A separate section on waterborne residuals deals with degradable residuals and persistent pollutants while the discussion on airborne residuals encompasses types and sources of such residuals, atmospheric assimilative capacity, and property damages. Technological external diseconomies are accepted as a fact, with residuals generation as an inherent part of production and consumption. Various alternatives are presented for both air and water pollution, incorporating a discussion of economic analysis to choose the optimal method for coping with such environmental difficulties. (Murphy-Rutgers)
W71-09889

ESSAY ON ECONOMIC GROWTH AND ENVIRONMENTAL QUALITY,
California Univ., Riverside.
Ralph C. d'Arge.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 25-41.

Descriptors: *Pollution, Environmental quality, *Wastes, Effluents, Model studies, Water quality, Water resource development, Investment, Demand, Assimilative capacity, Air, Land.
Identifiers: *Production, *Consumption, *Economic growth, Balance of payment, Recycling, Employment.

The existence of a mutual interdependence between economic policy and environmental policy is proposed on the basis that production-consumption and waste emission are joint human products. Illustration is provided by a theoretical astronaut lost in space, and a Harrod type model. The astronaut analogy is presented to clarify optimal rate of consumption theories. The Harrod model is presented to indicate the rate of consumption over time and to further support the theory of interaction between the economy and the natural environment. Empirical analyses are made of the effect of effluent charges of certain countries on their comparative international advantage. Particular attention is given to waste generation, and the finite characteristic of natural resources. This article is relevant to all the fields of natural resources, encompassing water, air, and land resources. (Murphy-Rutgers)
W71-09890

DELAWARE RIVER BASIN COMMISSION RULES OF PRACTICE AND PROCEDURE AND BASIN REGULATIONS--WATER QUALITY.
For primary bibliographic entry see Field 06E.
W71-09898

THE USE OF STANDARDS AND PRICES FOR PROTECTION OF THE ENVIRONMENT,
Princeton Univ., N.J.
William J. Baumol, and Wallace E. Oates.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971. p 42-54.

Descriptors: *Prices, *Taxes, *Government, *Environmental quality, Marginal cost, Social aspects, Costs Profits, Optimization, Pollution, Decision making, Public utilities.
Identifiers: *Subsidies, *Resource allocation, *Externalities, Social welfare employment, Inflation.

A means is suggested of achieving certain environmental standards that establish arbitrary levels of environmental quality. The method calls for imposition of charges on waste emissions sufficient to achieve these standards. The optimality properties and other advantages of the proposed pricing procedure are presented, and it is indicated that this particular method will achieve the desired reduction in pollution at minimum cost to the economy. The pricing and standards method proposed is contrasted with the Pigouvian technique of imposition of taxes or subsidies on externality-generating activities, and the former is shown to be more readily workable for somewhat the same effect. Projections for the success of the standards and pricing method are made, indicating a definite reduction in environmental pollution which aids in approaching optimal resource allocation. This method is relevant to the maintenance of the quality of water resources. (Murphy-Rutgers)
W71-09900

ENVIRONMENTAL CONTROL AND ECONOMIC SYSTEMS,
Handelshogskolan i Stockholm (Sweden).
Erck Dahmen.
Swedish Journal of Economics, Vol 73, No 1, March 1971, p 67-75.

Descriptors: *Environmental quality, *Economic analysis, Costs, Technology, Prices, Profits, Resource allocation, Decision making, Investment, Time.
Identifiers: *Capitalism, *Socialism, Charges, Regulation, Production, Growth, Public goods, Incentives, Socio-economic costs.

Environmental deterioration in countries with different economic systems is characterized. It proposes various methods to solve such difficulties in the different systems. Since the analysis is concerned with the basic causes of environmental pollution, the remedies proposed are relevant to the correction of water pollution problems in the United States. The cause of environmental pollution is industrialization and therefore is present in both a capitalistic and socialistic economy. A major factor in the failure of both systems to combat pollution has been inaccurate cost calculations, which has been responsible for misallocation of resources and environmental deterioration. Accurate cost calculations would encourage the choice of technological alternatives favorable to preserving the environment. Regulations are suggested as an alternative to charges for effective environmental policy compliances. (Murphy-Rutgers)
W71-09902

CANADIAN SCIENTIFIC PROGRAMS FOR OPTIMUM MANAGEMENT OF GREAT LAKES WATER RESOURCES,
Department of Energy, Mines and Resources, Ottawa (Ontario).
A. T. Prince, and J. P. Bruce.
In: Proceedings, Twelfth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc., 1969, p 877-882.

Descriptors: *Water resource development, *Great Lakes, *Economic analysis, *Management, Water quality, Erosion, Water supply, Shipping, Government, Eutrophication, Pollution, Recreation, Sewage, Waste treatment.
Identifiers: Socio-economics, Power plants.

A survey is presented of Canadian activities to promote optimum management of Great Lakes water resources. Problems dealt with include fluctuating water quantities, shore erosion, and deteriorating water quality. Economic solutions and implementaton for them are being sought by various government agencies, academic personnel and private organizations and individuals. Research for longer term problems and international aspects of management and shipping remains the domain of the federal agency. There is a survey of the research activities of the Canada Centre for Inland Waters, an organization responsible for major lake research. Recent research program developments are dealt with, giving particular attention to the areas of water balance, erosion, water quality, waste treatment, and hydrology. Coordination of research and data collection both with Canada and internationally is cited. Suggestions for the future propose that research activity respond to management needs and managers use immediatly relevant research results. (Murphy-Rutgers)
W71-09903

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, SECOND VOLUME.
Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.

Compiled by Carol Kriss and Daniel P Loucks Available from the National Technical Information Service as PB-200 727, $3.00 in paper copy, $0.95 in microfiche. Publication No 35, Water Resources and Marine Sciences Center, Cornell University, Ithaca, N Y, June, 1971, 253 p, 401 ref. OWRR Project W-111 (No1613) (1).

Descriptors: *Bibliographies, *System analysis, *Water resources, Optimization, Simulation analysis, Operations research, *Abstracts, Forecasting, Planning.

Presented is an annotated bibliography of some recent selected publications pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. This publication is a supplement to the annotated bibliography having the same title and published by the Cornell University Water Resources and Marine Sciences Center in August, 1969 (Publication No. 25). Most of the 400 references included in this volume were published during 1969 and 1970. Publications for 1971 are not included. Both subject and author indices are provided. Keywords (descriptors) are listed at the end of each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting in the planning and management of water resource systems.
W71-09465

CONVERGENCE CRITERIA FOR ITERATIVE HYDROLOGIC ROUTING MODELS,
Water Resources Engineers, Inc., Springfield, Va.
For primary bibliographic entry see Field 02A.
W71-09610

IMPROVEMENTS IN THE FINITE DIFFERENCE SOLUTION OF TWO-DIMENSIONAL DISPERSION PROBLEMS,
Guelph Univ. (Ontario).
For primary bibliographic entry see Field 05B.
W71-09611

HOW SWEDEN TACKLES POLLUTION,
Lund Univ. (Sweden).
For primary bibliographic entry see Field 05G.
W71-09687

INTRODUCTION TO OIL FIELD WATER TECHNOLOGY,
For primary bibliographic entry see Field 05E.
W71-09721

A GENERALIZED PROBABILISTIC APPROACH TO REGIONAL WATER SUPPLY ASSESSMENT,
Environmental Dynamics, Inc., Los Angeles, Calif.
John A. Dracup, Sharon G. Grant, Miguel A. Cardenas, and Thomas J. Fogarty.
Available from the National Technical Information Service as PB-200 999, $3.00 in paper copy, $0.95 in microfiche. Completion Report, December 1970, 125 p, 5 fig, 65 ref, 4 append. OWRR Project C-1410 (No 1980) (1).

Descriptors: *Runoff, *Precipitation (Atmospheric), *Water supply, Mathematical models, *System analysis, Rainfall-runoff relationships, *Regions, Planning, *Model studies.
Identifiers: *Regional water supply assessment.

A methodology is developed to predict available water supply levels for a region. Using the technique of system identification the relationship between precipitation and runoff is mathematically modeled by a non-linear, time-variant system of partial differential equations derived from a kinematic wave formulation. The theoretical model is adapted to a particular watershed using parameter identification techniques. The development mathematical model is utilized to generate runoff data from long term precipitation data. The methodology is particularly applicable to regions of long term precipitation data but limited streamflow runoff data. Predictions of available regional water supply can be made through the use of confidence interval estimations.
W71-09735

STOCHASTIC POPULATION DYNAMICS FOR REGIONAL WATER SUPPLY AND WASTE MANAGEMENT DECISION-MAKING,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 05G.
W71-09741

CONVOLUTION APPROACH TO THE SOLUTION FOR THE DISSOLVED OXYGEN BALANCE EQUATION IN A STREAM,
Geological Survey, Fort Collins, Colo.
For primary bibliographic entry see Field 05B.
W71-09820

A FAST FRACTIONAL GAUSSIAN NOISE GENERATOR,
IBM Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 07C.
W71-09823

WASTE WATER TREATMENT PLANTS.
Federal Water Pollution Control Administration, Washington, D.C.

In: Public Facility Needs, Washington, US Government Printing Office, 1966, p 175-183.

Descriptors: *Waste water treatment, *Government, Watercourse, Pollution, Sewers, Capital, Population, Costs, Financing, Economic analysis, Effluents, *Treatment facilities.
Identifiers: *Public works, User charges, Construction costs, Operating costs, Growth rates.

A study of waste water treatment plants is presented. The necessity for such facilities is cited to protect the public health from waterborne disease, to prevent nuisances, and to prevent or abate public watercourse pollution. The nature and composition of the waste water treatment plants are delineated through a description of the physical characteristics and standard of performance, and a discussion of existing capital plant in the United States. The construction and operating costs of the plants are presented, as well as the user charges for the facility. Annual expenditures for sewage treatment plants is included in a presentation of trend of capital outlays, which discusses various forms and sources of financing. Capital requirements and potential financing methods are included in a presentation of the needs and prospective capital outlays for waste treatment provision. The projection includes both cost estimates and an analysis of population factors. (Murphy-Rutgers)
W71-09866

ECONOMIC DECISION MODELS,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 06B.
W71-09868

REGIONAL ECONOMIC DEVELOPMENT: THE RIVER BASIN APPROACH IN MEXICO,
New York Univ., New York.
David Barkin, and Timothy King.
Cambridge, England: Cambridge University Press, 1970, 262 p.

Descriptors: *River basin development, *Resource allocation, Evaluation, Hydroelectric power, Project evaluation, Cost-benefit analysis, *Regions.
Identifiers: *Regional growth, Social cost, Social overhead capital, Internal rate of return, Linkage effect, Externalities, *Mexico.

This book considers the strategy of promoting regional development through river basin schemes using Mexico as a case study. The first section outlines the economic and political rationale for using integrated river basin schemes to carry out public investment in irrigation and hydroelectric projects. The Mexican River Basin Commissions represent an attempt to coordinate government expenditure under a semi-independent agency on a regional basis. The river basin projects are considered not only in terms of their contribution to increasing aggregate national income but also the effect of the projects on the supply of factors of production. The achievement of the river basin approach with respect to the absorption of unemployed and underemployed labor and natural resources is found to be unsatisfactory. The authors conclude that the river basin approach should be supplemented by other regional policies to achieve regional development. (Siegenthaler-Rutgers)
W71-09874

6B. Evaluation Process

NATIONAL CONFERENCE ON URBAN WATER RESEARCH, KEYNOTE AND PLENARY SESSION PAPERS.
Office of Water Resources Research, Washington, D.C.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price $0.25. (Proceedings) Mar 17-19, 1970, Georgia Institute of Technology, 1971. 31 p, 2 append.

Descriptors: *Urbanization, *City planning, *Decision making, Social change, Aesthetics, *Water resources development.
Identifiers: *Metropolitan water resources management, *Water resources research, Urban ecology.

This report contains the keynote and plenary session papers presented at the National Conference on Urban Water Research. A companion report presents the program of research developed from the conference recommendations. Physical facilities for the conference were generously provided by the Georgia Institute of Technology. The Office of Water Resources Research is indebted to the Environmental Resources Center and the Department of Continuing Education of the Institute for the conference arrangements. Contents include: Introductory Remarks, H Garland Hershey; keynote Address, William C. Ackermann; Resource Development in the Urban Environment, Harvey O Banks; The Social Consequences of Natural Resource Development in Urban Regions, Maurice M Feldman; The Economic Consequences of Natural Resource Development in Urban Regions, Joseph L. Fisher; and Engineering Alternatives in Natural Resource Development in Urban Regions, Samuel S Baxter. Appendix A presents the conference program agenda; appendix B is a roster of names and addresses of the 63 conference participants. (See also W71-09469)
W71-09468

A NATIONAL URBAN WATER RESOURCES RESEARCH PROGRAM.
Office of Water Resources Research, Washington, D.C.

Available from Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $0.35. (Proceedings), Mar 17-19, 1970, Georgia Institute of Technology, 1971, 54 p, append.

Descriptors: *Urbanization, *City planning, *Decision making, Social change, Aesthetics, *Water resources development.
Identifiers: *Metropolitan water resources management, *Water resoruces research, Urban ecology.

This report presents a program of research designed to improve water resources management in the urban environment. The proposed research program calls upon the physical, social, biological, and engineering sciences to develop knowledge required to shape solutions to present and future water problems in urban areas. Technology has a dual importance in this field: (1) the development, construction, and operation of physical works and equipment, and (2) the performance of urban water resources research. More information is needed on the hydrologic, biologic, and ecologic effects of urbanization, as well as means of measuring aesthetic and ecologic values against other tradition values. Research is also needed on the organization, determination of roles, the function and relationship of urban water resources institutions. The charge to OWRR is to identify research needs, to make these known, and to stimulate others to do research. What is clearly needed in the field of urban water resources research encompasses a broad range of problems. Significant results will depend on participation, cooperation, and coordination among Federal, State, and local governmental agencies, by the academic community, by industry, by private consultants and others qualified to conduct research. (See also W71-09468) (Wray-Chicago)
W71-09469

THE FUNCTION OF SOCIAL BEHAVIOR IN WATER RESOURCE DEVELOPMENT.
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.
Wade H. Andrews, and Dennis C. Geersten.
Available from the National Technical Information Service as PB-200 725, $3.00 in paper copy, $0.95 in microfiche. Center for Water Resources Research Report No 1, Utah State University, Logan, Utah, Dec 1970. 124 p, 2 fig, 55 tab, append. OWRR Project A-001-UTAH (7).

Descriptors: *Water resources development, Social aspects, *Attitudes, *Social values, *Planning, Decision making, Technology, Social change.
Identifiers: *Social behavior, Bear River Project, *Environmental problems.

Many water resource engineers and planners have indicated that some of the most difficult problems in successful water resource development relate to social problems. Social value alternatives, such as conservation, aesthetics, and recreation are involved in the choices of development, but cannot be easily quantified in economic terms. The present study deals with the effects of a proposal for the technological development of a water resource; in this case, The Bear River Project. The broad objectives of this exploratory work are: (1) to determine the social psychological value patterns affecting

water resource development; and (2) to determine how basic cultural and social organizational arrangements are interrelated in motivations and attitudes and affecting the development and use of water. One of the attitudes investigated in the study was concerned with whether interbasin transfer of water was right or wrong. Attitudes toward water use by various categories of residence provide insight into the location of likely support for future project proposals. It is expected that the broad exploratory nature of this study will provide a useful background for other studies with more specialized and limited goals. (Wray-Chicago)
W71-09470

A GEOGRAPHICAL MODEL FOR POLITICAL SYSTEMS ANALYSIS,
Clark Univ., Worcester, Mass. Graduate School of Geography.
Saul B. Cohen, and Lewis D. Rosenthal.
Geographical Review, Vol 61, No 1, p 5-31, Jan 1971. 3 fig, 28 ref.

Descriptors: *Systems analysis, *Political aspects, *Model studies, *Institutional constraints.
Identifiers: *Political process, *Geographical model, Venezuela.

The literature of contemporary political geography is wanting in methodological approaches by which general theory and hypotheses can be developed and tested. It is proposed that political geographers turn more directly to political processes and to the spatial consequences than has heretofore been the case, and that their efforts be cast within a political-geographical systems framework. The major points for analysis of political process are the political system, locational perspective, and the open/closed political system. A basic objective of analyzing process in a spatial context is to examine man's behavior in space. The force and extent of political action areas and counteraction areas are expressed by various measures of political socialization. What creates an action area is the acceptance of political policy by groups that count politically and the attendant social and economical consequences. A political systems model, Venezuela's petroleum and immigration transactions, is examined showing that the law-landscape thread is a key to the analysis of political system. The specific transactions discussed here have been viewed as elements in the total political process. The political systems model proposed here can serve as the analytical framework for an understanding of the relationship of process to geographical space. (Wray-Chicago)
W71-09471

COMPREHENSIVE WATER RESOURCES MANAGEMENT--THE PAST AND THE FUTURE,
Department of the Interior, Washington, D.C.
Everett A. Gordon.
Water Resources Bulletin, Vol 7, No 1, p 185-188, Feb 1971.

Descriptors: *Water resources development, *Environment, *Political aspects, Inter-agency cooperation, Economics.
Identifiers: *Water resources planning, *Environmental quality, Colorado River Basin, Environmental Protection Agency, Federal Water Quality Administration.

The historic approach to American water problems has been characterized by artificial separation of water quantity and water quality--often completely ignoring water economics. This separation is at all levels of government, with the resources management responsibility so divided that only through great effort to coordinate diverse programs and operations is the goal of comprehensive water resources management approached. It is apparent that water quality considerations should play a significant role in management decisions concerned with quantity. In dealing with water resources development the Congress is attempting to coordinate all levels of government action. Among professionals, academic training provides only a narrow discipline orientation. The best approach to water problems lies in unified and comprehensive management agencies that assemble all of the knowledge, ability, techniques, disciplines, and resources needed to accomplish the management job. (Wray-Chicago)
W71-09472

THE EXPANDING CITY,
Northeastern Illinois Planning Commission, Chicago.
Matthew L. Rockwell.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 25-31, May 1971.

Descriptors: *City planning, *Decision making, Management, Inter-agency cooperation, Social change, *Planning.
Identifiers: *Metropolitan areas, Public policy, Comprehensive planning, Northeastern Illinois Planning Commission.

The physical development and deterioration of metropolitan areas is discussed. Public improvement programs for metropolitan areas often are severely inadequate because of insufficient planning for growth and contradictions in objectives. Private improvements are usually more disorganized than in the public sector with private developers influenced by profit potential and zoning regulations. Land use problems are all conflicts between one human activity and another; we are crowded together and yet too far apart for convenience and efficiency. The Northeastern Illinois Planning Commission has a comprehensive plan which calls for a stronger mass transportation system, industrial development, and opportunity for each person to improve his cultural, social, and economic conditions. Recommendations are directed to improving planning agencies and to recognition of the special problems of cities. (Wray-Chicago)
W71-09473

THE DEVELOPMENT AND USE OF COAL SURFACE - MINED LANDS IN ILLINOIS,
Midwest Coal Producers Inst., Springfield, Ill.
L. S. Weber.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 41-46, May 1971.

Descriptors: *Land use, *Mining, *Water resource, Development, *Recreation, Reclamation, *Illinois.
Identifiers: *Coal surfaced-mined lands, Environmental quality.

Reclamation of surface-mined lands dates back to 1920. Methods of reclamation include tree growth, forage production (seeding), recreation (primarity associated with water areas), multiple and intensive use. Tree growth was an early development, by natural seeding or planting. In 1964 a more scientific approach to tree planting was initiated. In forage production, mined lands are used for pasture by seeding and fencing. Recreational use of water areas created by mining operations is often hampered by water pollution. The use of strip-mined areas for waste disposal (land fill) is becoming important. The new method of sludge disposal from metropolitan sanitary plants is being researched. Multiple use is evidenced in the use of forage areas for hunting and of the forest areas for camping and other recreational activities. Examples of intensive use that can and will be expanded are homesites and industrial or business developments. (Wray-Chicago)
W71-09475

WATER RELATED ENVIRONMENTAL SERVICES.
Central New York Regional Planning and Development Board, Syracuse.

Available from the National Technical Information Service as PB198 086, $3.00 in paper copy, $0.95 in microfiche. Local Planning Agency technical report, Syracuse N.Y., Nov 1970. HUD Project NYP. 200.

Descriptors: *Regional analysis, *Planning, *Water supply, *Water pollution, Drainage, Flood control, Sewers, Water consumption, New York.
Identifiers: *Cayuga County New York, *Cortland County New York, *Madison County New York, *Oswego County New York, *Onondaga County New York.

This report summarizes the analysis phase of water supply, sewage disposal, storm drainage, and flood control in the Central New York Region. Present and expected problems of service quality and quantity have been examined along with potential measures to alleviate these problems and ungrade service. Interservice and service-to-environment relationships, involving such factors as environmental quality, benefit-cost considerations, economics of scale, and inertie arrangements, were noted throughout the analysis. The analysis included an examination of the various possible solutions to each locale's needs; some of the more involved alternatives are dealt with in detail.
W71-09572

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1971.
Mississippi State Univ., State College. Water Resources Research Inst.
For primary bibliographic entry see Field 05G.
W71-09628

ECONOMIC DETERMINANTS FOR SEDIMENT MANAGEMENT ON A NORTH MISSISSIPPI WATERSHED,
Economic Research Service, Oxford, Miss. Natural Resource Economics Div.
For primary bibliographic entry see Field 05G.
W71-09632

WATER RESOURCES PROBLEMS AND OPPORTUNITIES ASSOCIATED WITH MULTIPLE-PURPOSE IMPOUNDMENTS,
For primary bibliographic entry see Field 05G.
W71-09633

METHODS FOR PROTECTING AREAS OF WATER ORIGIN,
Colorado River Commission of Nevada.
Ivan P. Head.
Proceedings of the Western Interstate Water Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965. p 125-130.

Descriptors: *Water resources development, *Regional analysis, *Project planning, Cost-benefit analysis.
Identifiers: *Feather River Project, Pacific Southwest Water Plan, Western States Water Council.

The author states the case for the development of a comprehensive Western Water Plan which would combine the requirements and resources of all the western states. He explains that in the past three methods have been used to protect the areas of water origin, namely recapture statutes, political muscle and regional planning. He argues that regional planning has the most benefits. (Holmes-Rutgers)
W71-09685

PLANNING FOR WESTERN REGIONAL WATER DEVELOPMENT,
California Univ., Los Angeles.
Ernest A. Engelbert.
Proceedings of the Western Interstate Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965 p 17-62. 3 fig, 2 tab, 57 ref.

Descriptors: *Water resources development, *Project planning, *Economics, *Federal finance.
Identifiers: *West, California State Water Plan, Colorado Basin, Pacific Southwest Water Plan, Snake - Colorado Project.

The author summarizes the major issues facing planners of water resource use in the western states. Whereas before 1965, U.S. water resource development was devoted primarily to the western states, the future promises more national concern with the subject. He discusses problems of planning, financing, priorities, and type of water resources development. (Holmes-Rutgers)
W71-09697

A CASE STUDY OF WATER RESOURCES DEVELOPMENT - AN ANALYSIS OF A PROPOSED PROJECT ON THE MISSOURI RIVER,
Cornell Univ., Ithaca. Water Resources and Marine Sciences.
Lawrence S. Hamilton, and Carlos D. Stern.
Technical Report No 28, April 1971, 2 p. OWRR Project A-024-NY (2).

Descriptors: Alternative costs, Annual benefits, Annual costs, Economic feasibility, *Economic justification, *Evaluation, *Hydroelectric power, *Missouri River, Montana (Multiple purpose projects), *Political aspects, Power marketing, *Recreation, *River basin development, Water resources, *Water resources development, *Wild rivers.

As a result of the analysis it is concluded that the 'Joint Report on Water and Related Land Resources for Missouri River, Fort Benton to Vicinity of Fort Benton, Montana, June 1963' fails to provide the decision maker with the range of information he would require and fails to provide a sufficiently accurate economic assessment of the benefits and costs to the Nation. Factual and conceptual inadequacies have been revealed. Factual inadequacies concern: use of reconnaissance data to formulate specific benefit and cost figures; uncertainties as to streamflow and evaporation loss; failure to include evaporation loss as a cost; failure to include reservoir filling as a cost; failure to include surge tanks and afterbays as costs; a rather amazingly low estimate for a bridge at the Judith River; a misleading figure for the mileage of the remaining stretch of wilderness waterway; inadequate consideration of the unstable nature of the Missouri Break rock formations; failure to account for or describe the scenic loss due to inundation; unsatisfactory methods of assigning recreation benefits; use of replacement flood control as a benefit of dams; use of 1957 data for power anslysis. Conceptual inadequacies concern: several of the eleven supposed alternative proposals are redundant and obscure clear choice; there is an assumption that there are no alternative uses for money not employed in maximum physical development of the river; lack of consideration of marginality with the assumption of unsatisfied, constant demand for any produce or service; failure to establish a need for peaking power or to study transmission costs. The study also concludes that the independent review process for such project development proposals is inadequate, being carried out by the Board of Engineers for Rivers and Harbors, Federal Power Commission, and the Missouri Basin Inter-Agency Committee. It is hoped that the Water Resources Council can adequately fulfill this role.
W71-09740

MANAGEMENT OF WATER QUALITY IN RELEASES FROM SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
For primary bibliographic entry see Field 04A.
W71-09742

SELECTIVE WITHDRAWAL AS A WATER QUALITY MANAGEMENT TOOL FOR SOUTHWESTERN IMPOUNDMENTS,
Texas Univ., Austin. Environmental Health Engineering Program.
For primary bibliographic entry see Field 04A.
W71-09743

ECONOMICS OF POLLUTION CONTROL,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 05G.
W71-09761

STATE AND FEDERAL OUTDOOR RECREATION FACILITIES.
Department of the Interior, Washington, D.C. Bureau of Outdoor Recreation.

In: Public Facility Needs, Washington, US Government Printing Office, 1966, p 520-531.

Descriptors: *Recreation, *Water resource development, *Economic analysis, Multiple purpose projects, Forests, Fishing, Swimming, Costs, Taxes, Capital, Financing, Government.
Identifiers: *Public facilities, *Developed facilities, User charges, Entrance fees.

A study is presented of two types of Federal and State recreation facilities, namely developed facilities and natural resources of land and water. Areas included encompass parks, forests, fishing and hunting areas, reservoirs, and picnic areas, all of which are discussed for both recreational value and economic worth to nearby communities. The recreation facilities are described, and the existing capital plant for such facilities is presented. Construction and operating costs are presented, with reference made to the wide variance caused by location, terrain, and facility design. User charges are broken down into campbround charges, entrance fees, user fees, and taxes. The trend of capital outlays is treated, with special attention being given to sources of financing for the recreation facility. The future needs and prospective capital outlays are forecast according to capital requirements and available sources of financing, such as taxation and the land and water conservation fund. (Murphy-Rutgers)
W71-09865

ECONOMIC DECISION MODELS,
Oregon State Univ., Corvallis.
James L. Riggs.
New York, McGraw-Hill, 1968, 401 p.

Descriptors: *Decision-making, Economic evaluation, Operations research, Marginal cost, Resource allocation, Linear programming, Risk, Uncertainty probability, Game theory, Interest rate.
Identifiers: *Economic decision models, Econometrics, Opportunity cost, Break-even analysis, Gantt chart.

This book is essentially a quantitative approach to practical management and government problems but also considers the theoretical and nonquantitative aspects of decision-making as well. The author outlines deterministic decision-models and then discusses probabilistic models. The use of linear programming to deal with resource allocation problem is illustrated through examples. Techniques such as cost-benefit analysis and the payback method are used to lead to a time evaluation of strategic projects. The author then considers decisions recognizing risk. Concepts of risk are defined and the effect of variability on the decision problem is recognized. Probabilistic models such as expected utility, discounted-decision trees, queuing and simulation are considered. The final decision models dealt with are those project evaluations made under uncertainty using game theory techniques. This book is relevant to water research concerned with decision-making and project evaluation. (Siegenthaler-Rutgers)
W71-09868

THE WORLD OF WATER,
Minnesota Univ., Minneapolis.
William C. Walton.
New York, Taplinger Publishing Company, 1970, 317 p.

Descriptors: *River basin development, Cost-benefit analysis, *Economic evaluation, *Water demand, Groundwater, Aquifer, Water pollution, Social welfare, Reimbursement, Decision-making.
Identifiers: *Water-based recreation, Water resource management, Opportunity cost.

This book considers the economic, legal, social, and physical aspects of water resource planning and management. The role of economic policy, reimbursement, and project evaluation in planning water development programs are discussed. The geologic problems concerned with groundwater are noted in conjunction with aquifer conditions. Five concepts of river basin development are outlined: multiple-storage project, basinwide management, comprehensive regional management, articulated land and water programs with unified administration. The author discusses various criteria that are used in decision-making for river basin planning including cost-benefit analysis, social criteria, political constraints and the physical environment and hydrologic criteria of feasibility. Examples of river basin planning in the United States and Germany are presented along with research studies that are used in comprehensive planning. (Siegenthaler-Rutgers)
W71-09870

DECISION MAKING THROUGH OPERATIONS RESEARCH,
Xavier Univ., Cincinnati, Ohio.
Robert J. Thierauf, and Richard A. Grosse.
New York, John Wiley and Sons, Inc, 1970, 570 p.

Descriptors: *Decision-making, *Operations research, Linear programming, Nonlinear programming, Uncertainty, Dynamic programming, Probability, Optimization, Game theory, Economic evaluation, Systems analysis.
Identifiers: *Heuristic programming, PERT, Decision tree Lagrange multiplier, Objective function, Matrix algebra.

This book considers available techniques of operations research that are readily applicable for decision-making. The author surveys quantitative methods, background material in probability theory and matrix algebra as a preparation for the application of decision-making models. Methods for dealing with decision-making under uncertainty are presented. The Program Evaluation and Review Technique (PERT) is outlined with its advantages and disadvantages discussed through use by government agencies. Optimization models are considered and distinguished from iterative models that search through many alternative courses of action for an optimal solution. The techniques of linear programming, nonlinear programming, dynamic programming, game theory, and Markov analysis are presented. Future trend in operations research are discussed with stress placed on heuristic programming. This book is relevant to water studies concerned with the application of operations research techniques to decision-making. (Siegenthaler-Rutgers)
W71-09871

SOME NEW APPROACHES TO RISK,
Pittsburgh Univ., Pa.
R. Bryne, A. Charnes, W. W. Cooper, and K. Kortanek.
Accounting Review, Vol 43, No 1, Jan 1970, p 18-37.

Descriptors: *Risk, Operations research, *Decision-making, *Probability, Capital budgeting, Linear programming, Sensitivity analysis, Economic evaluation.
Identifiers: *Chance-constrained programming, Payback period, Decision tree, Algorithm.

Newer methodological approaches to risk, conceptualized by information in the form of probability distributions, and considered. Some of the approaches proceed by reference to a single-figure-of-merit optimization while others are concerned with the explicit consideration of risk. The latter approaches such as linear programming and chance constrained programming are illustrated with example using different assumptions about the state of information for decision-making. Chance constraints can serve as a feasibility check on previous decision assumptions relative to risk policies. Examples of models including both rate of return and payback as well as risk are given for evaluating prospective projects. This paper is relevant for water research concerned with the application investment decision-making in the presence of undercertainty. (Siegenthaler-Rutgers)
W71-09872

RISK ANALYSIS IN PROJECT APPRAISAL,
International Bank for Reconstruction and Development, Washington, D.C.
Louis Y. Pouliquen.
Baltimore, Johns Hopkins Press, 1970, 79 p.

Descriptors: *Project evaluation, Risk, Resource allocation, Decision-making, Probability distribution, Cost-benefit analysis, Sensitivity analysis, Costs, Simulation, Correlation, Elasticity of demand.
Identifiers: *Rate of return, Present worth, Beta distribution, Growth rate.

This book discusses the applications of risk analysis to project appraisal based on World Bank examples. The methodology is illustrated through the case study of the Port of Mogadiscio. Initially, cost-benefit analysis was used but proved inadequate and sensitivity analysis was then used to narrow the sources of uncertainty in the variables. A risk analysis with cumulative probability distributions was used to deal with uncertainties and to generate economic rates of return. The author then considers some of the problems of risk analysis, namely, the correlation among variables, the choice of a probability distribution, and the means and cost of risk analysis. The conclusions of one study are that risk analysis is a useful technique for handling marginal projects, unusual uncertainties, optimization of project specifications, and project identification. This book is relevant to water research concerned with the role of risk in project evaluation. (Siegenthaler-Rutgers)
W71-09876

MODELS FOR INVESTIGATION OF INDUSTRIAL RESPONSE TO RESIDUALS MANAGEMENT ACTIONS,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09878

SYSTEMS ANALYSIS AND PROJECT MANAGEMENT,
Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
David I. Cleland, and William R. King.
New York: McGraw-Hill, 1968, 307 p.

Descriptors: *Systems analysis, *Planning, Decision-making, *Evaluation, Resource allocation, Operations research, Optimization cost-benefit analysis, Planning-Programming-Budgeting, Network design.
Identifiers: *Information system, Isocost line, PERT, Cantt chart.

This book presents systems analysis and project management in a form that demonstrates their applicability to a variety of governmental managerial environments. A conceptual framework for systems analysis is outlined that relies on the outcome array as a basic tool. The authors then consider the role of models in systems analysis and use cost-benefit analysis to illustrate the application of models to decision-making. The relationship between programming-planning-budgeting and systems analysis is outlined. The authors then discuss techniques for use in the planning and control of a particular project. Network planning is used to depict the interrelationship between activities and events and the sequence in which they are to be accomplished. The PERT method is utilized to convert time estimates for plan completion to an expected activity time. This book is relevant to the water administrator concerned with project planning and control. (Siegenthaler-Rutgers)
W71-09879

A METHOD OF ESTIMATING SOCIAL BENEFITS FROM POLLUTION CONTROL,
Handelshogskolan i Stockholm (Sewden).
For primary bibliographic entry see Field 05G.
W71-09881

BENEFITS AND BENEFICIARIES: CONTRASTING ECONOMIC AND CULTURAL DISTINCTIONS,
Oregon State Univ., Corvallis.
Courtland L. Smith, and Thomas C. Hozg.
Water Resources Research, Vol 7, No 2, April 1971, p 254-263.

Descriptors: *Water resource investment, Cost-benefit analysis, Evaluation, Optimization, *Decision making, Cost, Economic efficiency.
Identifiers: *Beneficiary, Benefactor, Role, Reciprocity, Subsidy, Income distribution.

The importance of the social and cultural context for water resource development decision making is considered. The authors examine cost-benefit analysis, an evaluative process for determining the ratio of benefits to costs in economic terms, which when translated into social terms considers the role of beneficiary or benefits and benefactor or costs. Comparative observations of peoples of the Pacific Northwest, Salt River Valley of Arizona, and the Sahara desert of Africa and their role in resource development show interesting differences in the nature of role performance relative to receipt of water resource benefits and repaying the cost of creating these benefits. The authors conclude that cost-benefit analysis is not an objective value free logical system, but it is a logical system conceived to optimize a unique set of cultural values. (Siegenthaler-Rutgers)
W71-09884

A PLANNING APPROACH TO THE PUBLIC GOOD PROBLEM,
Institute National de la Statistique et des Etudes Economiques, Paris (France).
E. Malinvaud.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 98-112.

Descriptors: *Planning, Budget constraints, Tax, *Decision making, Welfare economics, Demand.
Identifiers: *Public good, Equity, Collective consumption, Pareto optimal, Willingness to pay.

The theory of planning is used to deal with the problem of how to achieve an optimal provision of public goods. The model used has two consumers and two commodities (one public and one private good). First, the solution suggested by E. Lindahl is discussed as a part of the planning approach and found to be unsatisfactory from equity standards. The author modifies this solution to satisfy the equity provisions. Procedures using quantity indicators were then used and consideration was given to three requirements: convergence to an optimum, equitable treatment of the two consumers, and incentives for correct revelation of preferences. It was found that procedures using quantity indicators were more effective than procedures using tax indicators. This paper is relevant to water research concerned with the theory of planning and public goods. (Siegenthaler-Rutgers)
W71-09886

BACKGROUND FOR THE ECONOMIC ANALYSIS OF ENVIRONMENTAL POLLUTION,
Resources for the Future, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09889

ESSAY ON ECONOMIC GROWTH AND ENVIRONMENTAL QUALITY,
California Univ., Riverside.
For primary bibliographic entry see Field 05G.
W71-09890

URBAN LOCAL OUTDOOR RECREATION FACILITIES,
Department of Housing and Urban Development, Washington, D.C.
Jack A. Underhill.
In: Public Facility Needs, Washington, U.S. Government Printing Office, 1966, p 532-554.

Descriptors: *Recreation, *Capital, *Costs, *Financing, *Government, Beaches, Pools, Natural resource development, Government, Taxes.
Identifiers: *User charges, *Capital outlays, *Estimated needs, Recreation centers, Ownership, Expenditures.

Local, publicly owned facilities are discussed for outdoor recreation such as parks, playgrounds, beaches, pools, recreation building, and indoor recreation centers. The physical characteristics of such facilities are discussed, as are the services they render, and general guidelines for measuring their standards of performance. A discussion of existing capital plant includes national estimates, state distribution, and city distribution of the facilities discussed, as well as age, ownership and estimated current value of the facilities. Land acquisition, development, maintenance and operating costs precede a presentation of user charges that is broken down according to degree of use, extend of coverage, taxes, and borrowing. Trend of capital outlays includes local expenditure figures and cites such sources of capital as state, federal government, county, and private investment. A basis is given of projected needs of the facilities on a yearly basis, and according to community size, following which various sources for future financing are suggested. The important role of water use in outdoor recreation makes this article relevant to water based recreation studies. (Murphy-Rutgers)
W71-09892

SOME FACTORS ASSOCIATED WITH THE CEDLINE OF THE LAKE ERIE COMMERCIAL FISHING INDUSTRY IN OHIO,
Toledo Univ., Ohio.
Donald W. Lewis.
In: Proceedings, Twelfth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc, 1969, p 834-842.

Descriptors: *Lake Erie, *Fishing, *Economic analysis, Time, Costs, Economic efficiency, Technology, Population, Salting, Capital costs.
Identifiers: *Political factors, *Biological factors, Real value of catch, Storage, Freezing.

The problems associated with the decline of the commercial fishing industry on Lake Erie in Ohio are considered. The real value of the fishing catch is used as a measure of the state of the industry. An analysis of the timing places the start of the decline about 1943. The adverse effect of the changing fish population is considered a factor, although this is thought to be one of the lesser causes. Competition for the Ohio industry is categorized as largely between sportsmen and the Ontario commercial industry. Problems of competitive labor costs, labor productivity, permissive regulation, and stagnant technology are also cited. The industrial structure is characterized as weak and market competition from non-fish protein sources and freshwater fishery products is indicated as a strong factor contributing to the decline. The concluding remarks blame economic and political factors for the decline of the industry, in which biological factors

have also contributed a noticeable deleterious effect. (MurphyzRutgers)
W71-09897

COMPREHENSIVE WATER RESOURCES PLANNING--ITS IMPLICATIONS FOR FISH AND WILDLIFE RESEARCH AND MANAGEMENT,
Bureau of Commercial Fisheries, Ann Arbor, Mich.
Robert L. Scheuler.
In: Proceedings, Tenth Conference on Great Lakes Research, Ann Arbor, Braun-Brumfield, Inc., 1967, p 447-455.

Descriptors: *Water resources development, *Planning, *Great Lakes, *River basins, Government, Decision making, Flood control, Water supply, Navigation, Pollution, Fishing, Budgets, Forecasting.
Identifiers: *Comprehensive approach, Multiple-usage, Economic growth, Hydro-electric power.

The interests and research of the fish and wildlife biologist are correlated with comprehensive water resources planning of river basins. The history of such planning is surveyed and the development of water resources activities for the Great Lakes area is given special attention. A discussion of the implementation of the water resources planning is presented and such implementation is then related to the work and interests of the individual and agencies primarily concerned with fish and wildlife research and management. Indication is that this last section can also apply appropriately to many other water-related disciplines. Topics dealt within the study include multiple-usage of the water facilities, demand for water and land-related resources, Flood control, water supply, water quality, navigation, hydro-electric power, and outdoor recreation. Project needs, authorizations and projections are also discussed in light of their contribution to economic growth. (Murphy-Rutgers)
W71-09899

ENVIRONMENTAL CONTROL AND ECONOMIC SYSTEMS,
Handelshogskolan i Stockholm (Sweden).
For primary bibliographic entry see Field 05G.
W71-09902

CANADIAN SCIENTIFIC PROGRAMS FOR OPTIMUM MANAGEMENT OF GREAT LAKES WATER RESOURCES,
Department of Energy, Mines and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 05G.
W71-09903

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WISCONSIN WATER RESOURCE PROBLEMS,
Wisconsin Dept. of Natural Resources, Madison.
L. P. Voigt.
Wisconsin Conservation Bulletin, Vol 35, No 1, Jan-Feb. 1970, p 3-5. 2 fig.

Descriptors: *Water resources development, Water pollutinion control, Federal finance, Pulp and paper industry.
Identifiers: *Wisconsin Department of Natural Resources, Federal Water Pollution Control Act, Fox River.

The major water concerns of the State of Wisconsin are described. In order to continue water treatment efforts, flood plain management and recreational use of water supplies, the author explains the need for more federal funds. (Holmes - Rutgers)
W71-09485

CAN COST BE CUT,
Hazen and Sawyer, New York.
Walter B. Sinnot.
Journal American Water Works Association, Vol 62, No 11, p 694-704, Nov 1970. 1 tab.

Descriptors: *Water supply, Water pollution control, Cost comparisons, Project planning, Construction costs.
Identifiers: *Springfield, Mass., Littleville Reservoir, N.J. State Highway Dept., Middle Branch Westfield River, Connecticut River, Appalachian Mts.

Water resources are more costly every day. Here, a joint discussion of three ways to approach the engineer, the supplier, and the operator. Each has unique problems which beset him and costs incurred by their tasks. (Campbell-Rutgers)
W71-09488

COST OF WELLS AND PUMPS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 04B.
W71-09730

COST OF PUMPING WATER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 04B.
W71-09731

PUBLIC GOODS AND INCOME DISTRIBUTION,
Maryland Univ., College Park.
Henry Aaron, and Martin McGuire.
Econometrica, Vol 38, No 6, Nov 1970, p 907-920.

Descriptors: *Taxes, *Marginal utility, Economic efficiency, Resource allocation, Sensitivity analysis, Costs.
Identifiers: *Income distribution, Public good, Externalities, Utility function, User charge.

An alternative approach is presented to the measurement of the benefits and burdens of government expenditures on public goods. Previous studies of the distributional effects of public budgets have not acknowledged that allocation of the benefits of public goods depends on an assumed utility function. This study shows that the impact of the budget on income distribution cannot be evaluated unless a utility function is employed to estimate public good income. The choice of the utility function critically influences the results. The authors find that studies that focus on income brackets alone obscure some distributional questions and that a more fruitful approach should take account of the distributional impact of public budgets among groups defined not only on the basis of income but on economic, social, and demographic characteristics as well. This paper is relevant to water research concerned with the effect of water research projects on income distribution. (Siegenthaler-Rutgers)
W71-09873

CAPITAL ALLOCATION THEORY: THE STUDY OF INVESTMENT DECISIONS,
University of Southern California, Los Angeles.
Gerald A. Fleischer.
New York, Appleton-Century-Crofts, 1969, 291 p.

Descriptors: *Evaluation, *Decision-making, Risk, Interest rate, Depreciation, Sensitivity analysis, Probability, Decision theory, Capital cost, Marginal cost.
Identifiers: *Capital budgeting, Equivalence theory, Present worth, Cash flow, Payback method, Rate of return, Annual cost.

This book first describes the capital budgeting problem and then discusses the principles that form the rational basis for capital budgeting procedures. The mathematics of compound interest are then derived and the principal techniques of economic evaluation: annual cost, present worth, and rate of return are discussed. Each of these methods considers the amount and timing of cash flows; they differ only with respect to the reference time used. Procedures for dealing with investment proposals that are mutually exclusive are outlined for the selection of the optimal project. The author then considers the effect of uncertainty and presents several techniques based on sensitivity analysis, decision theory and probability theory for dealing with risk and uncertainty in capital budgeting. The author presents various procedures for implementing the capital budgeting theory in decision-making. This book is relevant to water studies concerned with decision-making and project evaluation. (Siegenthaler-Rutgers)
W71-09875

PANGLOSS ON POLLUTION,
London School of Economics and Political Sciences (England).
For primary bibliographic entry see Field 05G.
W71-09877

PRIVATE COSTS OF USING PUBLIC GOODS,
Purdue Univ., Lafayette, Ind.
Robert A. Meyer, Jr.
The Southern Economic Journal, Vol XXXVII, No 4, Apr 1971, p 479-488.

Descriptors: *Costs, *Government, *Economic analysis, *Optimization, Model studies, Prices, Technology, Government supports, Income, Taxes.
Identifiers: *Quasi-public goods, *Private goods, *Rejectability, *Excludability, Equilibrium, Transfers, Consumption, Multipliers, Constraints.

An attempt is made to clarify the term 'exclusion,' to discuss public goods, and to analyze the properties of general equilibria attainable as the outcome of voluntary agreement in the presence of private costs of using quasi-public goods. Excludability should be considered symmetric to rejectability in dealing with commodities provided by governmental units. Various stipulations are proposed for a non-excludable, non-rejectable commodity to focus on rejectability and private user cost elements. The analysis is then extended to propose stipulations for a non-excludable but rejectable commodity, termed a quasi-public good. The private costs for such a good are then presented, followed by an analysis of subsidies, lump-sum transfers, and laws for altering consumption of the good. The formal optimality conditions associated with quasi-public goods are presented with and without user costs. Changes in welfare implications stemming from models including these goods are discussed, and the existence of a general equilibrium is established for a model including quasi-public goods and the associated prices for private goods. This paper provides insight into the public good aspect of water resources and should be of interest to theoretically oriented water research. (Murphy-Rutgers)
W71-09893

BEHAVIOR OF THE FIRM UNDER REGULATORY CONSTRAINT: NOTE,
Polytechnic Inst. of Brooklyn, N.Y.; and Hawaii Univ., Honolulu.
Israel Pressmar and Arthur Carol.
American Economic Review, Vol LXI, No 1, Mar 1971, p 210-212.

Descriptors: *Public utilities, *Economic efficiency, *Investment, *Rate of return, Prices, Government, Demand, Optimization, Capital, Profit.
Identifiers: *Regulatory constraint, *A-J effect, *Monopoly, Continuity, Marginal revenue product.

The 'A-J Effect', holding that a firm will tend to increase its investment with the introduction of an active constraint on its rate of return, is scrutinized. This effect was postulated both by the persons for which it is named (Averch and Johnson) and by Takayama. The authors of this article show that the 'A-J Effect' cannot be derived from the basic assumptions of the model since the assumptions used

require an assujption that the 'A-J Effect' exist in the first place. The model is presented and then analyzed in light of the assumptions involved, particularly the offending equations used to derive the conditions for continuity, which depend for their usefulness on the preexistence of the A-J effect. The authors then prove that the A-J effect is impossible without these two assumptions (which are invalid). This article is particularly relevant to the regulation of natural monopolies such as water utilities. (Murphy-Rutgers)
W71-09894

A NOTE ON SUPPLEMENTAL APPROPRIATIONS IN THE FEDERAL BUDGETARY PROCESS,
Carnegie Inst. of Tech., Pittsburg, Pa.
Gary W. Bowman, Otto A. Davis, Henry J. Gailliot, and Alan C. Hess.
In: The Planning-Programming-Budgeting System: Progress and Potentials, Washington, The U.S. Government Printing Office, 1967, p 252-262.

Descriptors: *Government, *Budget, Social aspects, Statistics, Correlation, Decision making, Financing, Model studies, Research.
Identifiers: *Supplementals, *Allocation process, Non-defense agencies, Behavioral model, Expectations receipts, Unemployment.

A report is presented on the research concerning supplemental appropriations as one type of sources for funds for the agencies of the United States government. Relevant aspects of the allocation of these appropriations to non-defense agencies are presented in a summary of findings by Davis, Dempster and Wildavsky. Several alternative behavioral models of the process of making supplemental appropriations are presented, and various empirical tests of these models are presented. In addition, two models reflecting macro considerations are discussed in contrast to the micro-oriented models first presented. Factors affecting supplementals may properly be excluded from the regular budgetary process, since these determinates are so agency-specific that unexpected contingencies would have to be predicted to deal adequately with the supplementals. This article is relevant to government appropriations receptors, particularly those involved with federal water resource projects. (Murphy-Rutgers)
W71-09895

THE USE OF STANDARDS AND PRICES FOR PROTECTION OF THE ENVIRONMENT,
Princeton Univ., N.J.
For primary bibliographic entry see Field 05G.
W71-09900

6D. Water Demand

EXPLORING LAKE MICHIGAN WETLANDS,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Research.
Stanton J. Kleinert.
Wisconsin Conservation Bulletin, Vol 35, No 1, Jan-Feb 1970, p 18 and 19. 3 fig.

Descriptors: *Wetlands, Wildlife conservation, Recreation demand, Cost-benefit analysis.
Identifiers: *Lake Michigan, Atkinson Marsh, Green Bay.

The beneficial features of lakeshore wetlands are explored and their usefulness for birds, fish, hunters, recreation and study are explained. With more appreciation for the role of wetlands, people are becoming more aware of the importance of preserving remaining wetlands. (Holmes-Rutgers)
W71-09487

CHARACTERISTICS OF HOUSEHOLD WATER CONSUMPTION IN THREE NEW HAMPSHIRE COMMUNITIES (APPENDIX),
New Hampshire Univ., Durham. Water Resources Research Center.
Richard A. Andrews, and Martha R. Hammond.
Research Report No 3, Statistical Appendix, December, 1970, 16 p, 17 ref, 3 append. OWRR Project A-018-NH (2).

Descriptors: *Water utilization, *Domestic water, *New Hampshire, *Water users, Water demand, Water costs, Lawns, Utilities, Water management (Applied), Water requirements, Cities.
Identifiers: *Household water consumption.

The purpose of this Appendix is to present a detail description of the study design and select estimated regression equations based on the highest R2 with the most number of significant variables for use by professional workers in water resources fields. Several regression equations for each community are presented for evaluation of the results of the study and to provide alternatives in selection of a most usable equation for some defined purpose. It is felt that no one equation would serve all purposes or be of sufficient explanatory power for developing of confidence in the estimates obtained when applied to practical problems. Each community is treated separately due to an apparent 'community' or 'neighborhood' influence. The study was not designed to test for this influence on water consumption. Only for Durham and Epping is the 'neighborhood' effect even modestly identifiable in statistical analysis. To test for 'neighborhood' effect, more identifiable neighborhoods would be required along with more information about the neighborhood and its boundaries. (See also W71-08323)
W71-09563

DROUGHT AND WATER SUPPLY - IMPLICATIONS OF THE MASSACHUSETTS EXPERIENCE FOR MUNICIPAL PLANNING,
Resources for the Future, Washington, D.C.; and Pittsburgh Univ., Pa. Dept. of Geography; and Clark Univ., Worcester, Mass. Dept. of Geography.
Clifford S. Russell, David G. Arey, and Robert W. Kates.
Research conducted under an RFF grant to Clark Univ. Baltimore, Maryland, The Johns Hopkins Press, 1970, $8.00. 232 p, 29 fig, 56 tab, 8 append.

Descriptors: *Water supply, *Droughts, *Massachusetts, *Water resources development, *Municipal water, Model studies, Planning, Water demand, Water yield, Water costs, Water shortage, Water storage, Reviews, Forecasting.

The drought in Massachusetts of 1962-66 was studied to determine the adequacy of community water supply systems in terms of physical structure and operation, and the capacity of communities to adapt to drought conditions. The data developed were in turn used in a model depicting the efficient expansion of an existing water supply system. This study is part of a small but growing literature which explores society's ability to cope with natural hazards. In making explicit the service capacity of a water system under drought conditions, by considering the curtailment of water use as an investment, and by expressing 'losses' in dollar terms, important options for future water system planning are developed. (Woodard-USGS)
W71-09652

PRESENT OPERATIONAL PROBLEMS AND FUTURE WATER SUPPLY NEEDS IN ANKARA, TURKEY,
Camp, Dresser and McKee, Boston, Mass.
For primary bibliographic entry see Field 03D.
W71-09694

A WATER RESOURCE-WATER SUPPLY STUDY OF THE POTOMAC ESTUARY,
Environmental Protection Agency, Annapolis, Md. Chesapeake Technical Support Lab.
For primary bibliographic entry see Field 05B.
W71-09788

THE WORLD OF WATER,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 06B.
W71-09870

AN APPROACH TO THE PROBLEM OF ESTIMATING DEMAND FOR PUBLIC GOODS,
Stockholm Univ. (Sweden).
Peter Bohm.
Swedish Journal of Economics, Vol 73, No 1, Mar 1971, p 55-66.

Descriptors: *Demand, *Government, *Environmental quality, Costs, Taxes, Prices, Waste treatment, Lakes, Swimming, Fishing, Uncertainty, Statistics, Population, Social aspects.
Identifiers: *Estimation, *Public goods, McGuire-Aaron model, Incentives, Willingness to pay, Credibility.

A method is suggested for estimating the demand for such public goods, as environmental quality, when the decision-makers are unaware of the maximum willingness to pay in relation to costs as well as the willingness to pay in different consumer groups. The method is developed because consumers do not reveal their true preference for such public goods. A simplified example of the proposed method is presented, utilizing the problem of demand for waste treatment facilities to render a polluted lake suitable for swimming and fishing. The problems of credibility and incentives to distorted demand are surveyed, as is the problem of selection of an appropriate population sample. The pure theory of public goods is then presented, including the McGuire-Aaron model, the supply of public goods, and policy costs. Finally, there is a treatment of the problem of selecting optimal procedures for estimation of demand for public goods. (Murphy-Rutgers)
W71-09887

6E. Water Law and Institutions

FLOOD DAMAGE ABATEMENT STUDY FOR VIRGINA,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 06F.
W71-09467

EQUITABLE ACCESS TO THE OCEAN'S WEALTH,
Food and Agricultural Organization of the United Nations, Rome (Italy).
Tony Loftas.
Ceres, Vol 3, No 5, p 34-38, Sept - Oct 1970. 3 figures.

Descriptors: *Oceans, Natural resources, Economics, International law, Political aspects.
Identifiers: *United Nations, UN Seabed Committee, Malta, 1958 Continental Shelf Convention.

The political and economic problems of exploitation and use of the oceans' resources has concerned the nations of the world for thousands of years. All marine problems are intimately related to one another. A new world body with independent means and legal powers could provide a solution to these international disputes. (Homes-Rutgers)
W71-09481

THE WATER RESOURCES PLANNING ACT OF 1965 AND FEDERAL-STATE COLLABORATION IN RESOURCE PLANNING,
Department of the Interior, Washington, D.C.
Henry P. Caulfield Jr.
Strategies for Western Regional Water Development, Proceedings of the Western Interstate Water Converence, Corvallis, Oregon, p 143-153, 1965. 4 ref, 2 tab.

Descriptors: *Water resources development, Project planning, Federal government, State governments, Administration.
Identifiers: *Gallatin, Calhoun, Land and Water Conservation Fund Act, Water Resources Council, Water Resources Planning Act.

The Water Resources Planning Act begins an opportunity for the federal government to work with the states in coordinating water planning and other related resources. It requires a joint comprehensive plan to be kept and coordinated on all levels of government by the commission which is the act's principal agency. (Campbell-Rutgers)
W71-09482

SHORELAND ZONING COMES TO WISCONSIN,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water and Shoreland Management.
Robert M. Roden.
Wisconsin Conservation Bulletin, Vol 36, No 1, Jan-Feb 1971, p 10 and 11.

Descriptors: *Water law, Administration, Zoning, State governments.
Identifiers: *Wisconsin, Dodge County, Division of Environmental Protection, Water Resources Act, Natural Resources Board.

The Water Resources Act of Wisconsin requires all counties in the state, with the exception of Milwaukee County, to comply with stated standards for lot sizes, building setbacks from the water, protection of shoreland vegetative cover and controls over filling, grading, dredging, and lagooning of lakes and streams. The history and motivation for the legislation are reviewed, as well as the progress toward implementation. (Holmes - Rutgers)
W71-09486

PERMITS FOR WORK IN NAVIGABLE WATERS.

Federal Register, Vol 35, No 2, p 79-81 (Jan 1970). 3 p.

Descriptors: *Permits, *Navigable waters, *Structures, *Administrative agencies, Navigation, Water pollution, Water pollution control, Pollution abatement, Fish, Wildlife, Fish conservation, Wildlife conservation, Conservation, Environmental effects, Ecology, State governments, Local governments, Regulation, Adjudication procedure, Administration, Administrative decisions.

The Corps of Engineers has amended its regulations governing work to be performed in navigable waters. Issuance of permits must be based upon consideration of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, pollution, aesthetics, ecology, and general public interest. As to permits for construction of fixed structures on the Outer Continental Shelf, the decision will be based on the effect upon navigation and national security. However, even when the structure is unobjectionable, if state and local authorities decline to consent to the work, a permit will not be issued. In such cases the applicant will be informed that a permit would be issued if local consent were forthcoming. The amendment also provides detailed requirements for furnishing notice to the public and interested parties, and for consultation with interested parties. Requirements for public hearings and the procedures to be followed at such hearings are also set forth in detail. (Hart-Florida)
W71-09495

POWERS OF CITIES: WATER MANAGEMENT AND POLLUTION CONTROL.
Revised Code of Washington Ann secs 35.22.280, 35.23.440, 35.24.290 (1965).

Descriptors: *Washington, *Water pollution control, *Municipal water, *Cities, Water pollution, Water quality control, Pollution abatement, Public health, Bridges, Bridge construction, Sewers, Streams, Lakes, Canals, Ponds, Ponding, Legal aspects, Legislation.

These sections enumerate the powers granted to cities of the first, second, and third classes. First and second class cities are empowered: (1) to control and punish pollution of all streams within five miles of their corporate limits, and of any stream or lake used for municipal water supply, within five miles of the source of supply; and (2) to clean and purify watercourses or drain and fill ponds on private property when they are offensive to the senses or dangerous to health. Third class cities are given jurisdiction over all sources of municipal water, both within and without the city limits, for the purpose of purification and pollution control, which may be effected by criminal ordinance. Second and third class cities are authorized to operate sewers, widen and improve waterways, and erect bridges. (Madsen-Florida)
W71-09520

STUDY RELATING TO ENVIRONMENTAL POLLUTION.
Public Law No 91-515, sec 501, 84 Stat 1297, 13 US Code Cong and Admin News p 5350-5351 (1970). 2 p.

Descriptors: *Public health, *Air pollution effects, *Water pollution effects, *Pollution abatement, Pollutants, Air pollution, Water pollution, Water pollution control, Water pollution sources, Water pollution treatment, Federal government, Legislation, Legal aspects, Environment, Air environment, Safety, Environmental sanitation, Data collections.

The President shall initiate a study of the following: (1) the nature and gravity of the hazards to human health and safety created by air, water and other common environmental pollution; (2) medical and other assistance available to persons affected by such pollution, especially when such pollution reaches emergency levels; and (3) the measures, other than those relating solely to the abatement of pollution, that may be taken to avoid or reduce the effects of such pollution on the health of individuals. The President shall submit this report to Congress within nine months of the enactment of this Act. This report shall include the following: (1) his conclusions regarding the gravity of the hazards to human health, (2) his evaluation of the available medical assistance when pollution reaches emergency levels, (3) his assessment of the measures that may be taken to avoid or reduce the effect of pollution on health, and (4) legislative or other recommendations. This report shall be updated annually. (Robinson-Florida)
W71-09552

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.

Federal Register, Vol 35, No 190, p 15216-15221 (Sept 1970). 6 p.

Descriptors: *Oily water, *Damages, *Water pollution control, *Water quality control, Oil, Oil wastes, Legislation, Federal government, Administration, Administrative decisions, Administrative agencies, Legal aspects, Regulation, Pollution abatement, Water policy, Water pollution, Water pollution sources, Water quality, Navigable waters, Financing.
Identifiers: *Water Quality Improvement Act.

Pursuant to the Water Quality Improvement Act of 1970 the Chairman of the Federal Maritime Commission herein proposes regulations concerning financial responsibility for oil pollution cleanup. The regulations define many terms used by the Act. Public vessels shall include vessels owned or bareboat chartered by a state. All vessels whether oil free or not are encompassed by these regulations. Owners or operators may file applications and establish evidence of financial responsibility. Corporate officers, personal owners, operators, and partners need not submit evidence of their authority to sign the application. An owner or operator may establish financial responsibility by insurance, surety bonds, guarantees, or self insurance. Deductible provisions in insurance policies are acceptible if the applicant evidences supplemental coverage for the deductible amount. Each vessel will be covered by a separate certificate of financial responsibility. No vessel over 300 gross tons shall use any port or navigable waters of the United States unless a certificate of financial responsibility has been issued covering such vessel. The procedures and methods of establishing financial responsibility are detailed in these regulations. Grounds for denial, revocation, or suspension of a certificate are also specified. (Robinson-Florida)
W71-09564

CONTRA COSTA COUNTY AND THE PERIPHERAL CANAL,
Contra Costa County Water Agency, Martinez, Calif.
For primary bibliographic entry see Field 06G.
W71-09579

ENVIRONMENTAL STATEMENT ON THE PROPOSED ELECTRIC POWER ENVIRONMENTAL POLICY ACT.

Federal Register, Vol 35, No 205, p 16440-16448 (Oct 1970). 9 p.

Descriptors: *Electric power demand, *Environmental effects, *Administrative agencies, *Powerplants, Administrative decisions, Regulation, Federal government, State governments, Legal aspects, Legislation, Planning, Engineering structures, Nuclear powerplants, Electric powerplants, Thermal powerplants, Hydroelectric plants, Electrical engineering, Environment, Environmental engineering, Water pollution, Water utilization, Water supply, Electric power.

Pursuant to the requirements of the National Environmental Policy Act the Federal Power Commission submits for comment a statement evaluating the environmental impact of the proposed Electric Power Environmental Policy Act, which is designed to ensure adequate electrical power supplies for the nation by facilitating the timely construction of generating facilities. The basic objective of the proposed act is the achievement of harmony between adequate power supplies and environmental protection. Public and private electric entities will have to acquire certification of powerplants and lines well in advance of construction. State or regional certification of sites and facilities will be required except for those facilities owned or operated by the federal government. If state agencies fail to take action the Federal Power Commission will exercise the certification responsibility. Certification will be granted when it appears that there is a valid need for power and that neither public health and safety nor ecological systems will be irreparably harmed. The Federal Power Commission will be authorized to delegate to the Atomic Energy Commission the certification of nuclear facilities. (Robinson-Florida)
W71-09589

UNITED STATES V VULCAN MATERIALS CO (POLLUTION PROSECUTION UNDER THE NEW YORK HARBOR ACT).
320 F Supp 1378-1381 (D NJ 1970).

Descriptors: *New Jersey, *Pollution abatement, *Water pollution control, *Water quality control, Federal government, Legislation, Judicial decisions, Legal aspects, Pollutants, Water policy, Water pollution, Water quality, Harbors, Industrial wastes, Oil wastes, Acids, Alkalis (Bases), New York.

The United States prosecuted defendant manufacturers for discharging acid, alkaline, and oil waste

into New York Harbor in violation of the New York Harbor Act. The substances discharged by defendant were liquid and entered the water by a sewer line. Defendant contended that the discharge was permitted by the statute, since the statute only applied to discharges which would be navigational obstructions. Defendant argued that the Federal Water Pollution Control Act impliedly repealed the New York Harbor Act. Other contentions of defendant were: (1) it was unfair to prosecute defendant when New Jersey had instituted civil proceedings against them, (2) defendant had expended 'millions' to correct the problem, and (3) defendant was taking appropriate steps to remedy the situation. Defendant's motion to dismiss was denied by the federal district court. Discharge of acids, alkalines, and oil is in violation of the statute, since the statute contemplates organic matter which will decompose. The Federal Water Pollution Control Act does not repeal the New York Harbor Act. A defendant's expenditures and efforts do not exempt him from criminal prosecution, nor does the fact that civil proceedings have been instituted against him. (Robinson-Florida)
W71-09660

ESTABLISHING THE ENVIRONMENTAL QUALITY COUNCIL AND THE CITIZENS ADVISORY COMMITTEE ON ENVIRONMENTAL QUALITY,
Richard M. Nixon.
Exec Order No 11472, Code of Federal Regulations, Title 3, Chap II, p 122-125 (1969 Compilation). 4 p.

Descriptors: *Environment, *Administrative agencies, *Environmental effects, *Federal project policy, Federal government, State governments, Local governments, Administration, Water pollution, Water pollution control, Water pollution sources, Pollutants, Pollution abatement, Regulation.

The Environmental Quality Council, consisting of the President, Vice-President, and the Secretaries of Agriculture, Commerce, HEW, HUD, Interior, and Transportation, is formed to advise and assist the President on environmental quality matters, including: (1) recommendation of measures to ensure that federal policies and projects take adequate account of environmental effects; (2) review of the adequacy of existing systems for monitoring and predicting environmental changes; (3) encouragement of federal, state, and local cooperation; (4) stimulation of public and private participation in programs to prevent and abate pollution; (5) encouragement of technological development to prevent adverse environmental effects; (6) encouragement of timely disclosure of plans affecting environmental quality; (7) assessment of new technologies for their potential environmental effects; and (8) facilitation of coordination among federal administrative agencies in protecting the environment. Additionally, the Council shall review plans of federal agencies affecting outdoor recreation and natural beauty. The Citizens' Advisory Committee on Environmental Quality has 14 members, who shall advise the President and the Council on the duties assigned to the Council. (Hart-Florida)
W71-09663

WESTERN WATER ORGANIZATION AS A POLITICAL PHENOMENON,
Colorado Univ., Boulder.
Conrad L. McBride.
Proceedings of the Western Interstate Water Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965, p 170-174. 2 ref.

Descriptors: *Water resources development, *Decision making, *Political aspects, *Institutional constraints.
Identifiers: *Report of the Task Force on Water Resources, Upper Colorado River Compact.

The article discusses the lack of clear cut scientifically developed policy in the field of water resources development. However, he questions whether under our system of government public policy needs to be that well defined. He argues that the proliferation of water resource organizations, some of which repeat one another's efforts, creates a healthy situation and allows for compromise. (Holmes-Rutgers)
W71-09684

INTERSTATE SANITATION COMMISSION--POWERS.

Public Act No 7, Connecticut Legislative Service, p 6-7 (1969). 2 p.

Descriptors: *Connecticut, *Interstate compacts, *Interstate commissions, *Water quality control, Tidal waters, Legislation, Water policy, Water pollution control, Water pollution, Water purification, Water quality, Pollution abatement, Pollutants, Waste disposal, Waste water (Pollution), Biochemical oxygen demand, Effluents, Solid wastes, Liquid wastes.

The signatory states of the Interstate Sanitation Commission agree that no sewage or pollutants shall be allowed in the tidal waters of the district unless the following conditions and restrictions are met. All sewage discharged into class 'A' waters shall be treated as follows: (1) all floating solids and 60% of suspended solids shall have been removed, (2) intestinal bacilli shall be reduced to not more than one per cubic centimeter in more than 50% of sewage effluents tested, and (3) average dissolved oxygen of not less than 50% saturation shall be maintained. Sewage discharged into class 'B' waters must have all floating solids and 10% of suspended solids removed, and the average dissolved oxygen content must be not less than 30% saturation. Other classifications of waters and effluent standards may be developed, after public hearing, in addition to or in substitution of those set forth in this Article or Article VI of the compact. Any such additional or substitute classifications and standards shall take effect when the states of New Jersey and New York have similarly amended the tri-state compact. (Robinson-Florida)
W71-09688

USE OF CHEMICALS, MATERIALS OR TECHNIQUES TO TREAT OIL SPILLS (MASSACHUSETTS POLICY STATEMENT).
Massachusetts Div. of Water Pollution Control, Boston.

Commonwealth of Massachusetts, Division of Water Pollution Control, Publication No 5394, nd. 7 p, 1 append.

Descriptors: *Massachusetts, *Chemcontrol, *Oily water, *Administrative agencies, Water pollution sources, Water pollution treatment, Commercial shellfish, Freshwater fish, Saline water fish, Fishkill, Pollution abatement, Abatement, Water pollution.

The Massachusetts Department of Water Pollution Control has established a policy with regard to the chemical treatment of oil spills. While physical and mechanical means are expressly favored, floating non-toxic insoluble chemical absorbents may be used without restriction. Use of chemical dispersants is discouraged; they may only be used under restricted conditions and with the prior approval of the Department. The restrictions are consistent with those contained in the National Oil and Hazardous Materials Pollution Contingency Plan. The use of chemical sinking agents is prohibited. Telephone numbers are listed for the reporting of oil spills. An appendix contains an analysis of the tolerance of fresh and salt water fish to particular commercial brands of dispersant chemicals. (Kohla-Florida)
W71-09689

AD VALOREM TAX EXEMPTION FOR ANTI-POLLUTION DEVICES, SYSTEMS AND FACILITIES.
Act No 1137, Acts of Alabama, p 2123-2126 (1969). 4 p.

Descriptors: *Alabama, *Taxes, *Pollution abatement, *Treatment facilities, Assessments, Land appraisal, Tax rate, Water pollution, Air pollution, Water quality control, Water pollution treatment, Government finance, State governments, Industries, Legislation, Legal aspects.
Identifiers: *Tax exemptions.

A prior act providing for certain exemptions from state ad valorem taxation is hereby amended to include exemptions for anti-pollution devices. All devices, systems or facilities constructed, used, or placed in operation primarily for the protection of the public interest through the abatement of air and water pollution shall be exempt from state ad valorem taxation. (Smiljanich-Florida)
W71-09692

GOVERNMENTAL RESPONSIBILITIES FOR WATER DEVELOPMENT,
Oregon State Univ., Corvallis.
James H. Jensen.
Proceedings of the Western Interstate Water Conference, Strategies for Western Regional Water Development, Corvallis, Oregon, 1965, p 116-124. 2 ref.

Descriptors: *Water resources development, *Project planning, *Economic feasibility, State governments.
Identifiers: *Oregon State University, Willamette Basin Study, Puget Sound Study, Columbia Basin Survey.

This article describes the role that states can and should play in planning water resource development. By citing several examples of studies carried out at Oregon State University the author illustrates the constructive role of states. Instead of commenting on a study completed by a federal agency, a state can make a more positive contribution by conducting a study of its own. (Holmes-Rutgers)
W71-09696

STATE CERTIFICATION OF ACTIVITIES REQUIRING FEDERAL LICENSE OR PERMIT.

Federal Register, Vol 36, No 25, p 2516-2518 (Feb 1971). 3 p.

Descriptors: *Administrative agencies, *Permits, *Water pollution control, *Navigable waters, Pollution abatement, Water pollution, Water pollution sources, Administration, Regulation, Discharge (Water), Sediment discharge, State governments, Interstate commissions.
Identifiers: *Water Pollution Control Act.

The Federal Water Pollution Control Act requires applicants for a federal license to conduct activity which may result in discharges into navigable waters of the United States to obtain certification that such activity will not violate applicable water quality standards. Proposed rules to regulate certification are in four parts. Part A provides definitions of general applicability for the regulations and rules governing uniform content and form of certification. Part B establishes procedures for determination by the Administrator as to whether a discharge may affect the quality of waters of a state other than the state where the discharge originates. Part C establishes procedures for certification by the Administrator where standards have been promulgated by him, and where no state or interstate agency has authority to certify that there is reasonable assurance that the activity resulting in discharges will be conducted in a manner not violating water quality standards. Part D provides for consultation between the Administrator and federal licensing and permit-issuing agencies with respect to the meaning, content, and application of

water quality standards and related matters. (Hart-Florida)
W71-09698

CERTIFICATION OF FACILITIES FOR WATER POLLUTION CONTROL.

Code of Federal Regulations, Title 18, Chap V, part 602 (1970). 3 p.

Descriptors: *Water pollution control, *Treatment facilities, *Administrative agencies, *Taxes, State governments, Local governments, Administrative decisions, Regulation, Water treatment, Waste treatment.

Under section 48 of the Internal Revenue Code, the Secretary of the Interior certifies facilities for purposes of the section 38 depreciation deduction. Regulations governing certification are contained in this publication. After defining various terms, general provisions for filing and routing of applications are set forth. If the certification is refused, the applicant must be informed of the reasons for refusal. Next, the information required in the application is delineated. No application will be approved by the Secretary unless it is accompanied by a state certification that the facility conforms to state requirements for water pollution control. The general policies of the United States for cooperation with the states in prevention and abatement of water pollution are also promulgated. A facility will be certified if the Secretary determines that it complies with these regulations, regulations of other agencies, and the general policies. Five factors are to be considered by the Secretary in his determination: (1) water quality standards and implementation plan; (2) recommendations issued pursuant to the Federal Water Pollution Control Act; (3) state pollution control programs; (4) comprehensive pollution controls under section 3 of the Water Pollution Control Act; and (5) local standards for water pollution control. (Hart-Florida)
W71-09699

NOTICE OF A MEMORANDUM OF UNDERSTANDING PROVIDING FOR COOPERATION IN THE INVESTIGATION OF VIOLATIONS OF THE REFUSE ACT.
Department of the Army, Washington, D.C.

Federal Register, Vol 36, No 32, p 3074-3075 (Feb 1971). 2 p.

Descriptors: *Water pollution control, *Administrative decisions, *Water quality control, *Pollution abatement, Federal government, Federal jurisdiction, Regulation, Administration, Administrative agencies, Legal aspects, Water policy, Water pollution, Water quality, Interstate rivers, Navigable waters, Pollutants, Permits.
Identifiers: *Refuse Act.

Pursuant to the Refuse Act and the Federal Water Pollution Control Act a memorandum of understanding between the Department of the Army and the Environmental Protection Agency (EPA) is promulgated to provide for cooperation in the investigation of violations of the Refuse Act. The Department of the Army has primary responsibility for enforcement of the Refuse Act, and the EPA has primary responsibility for the control of pollution of interstate and navigable waters. Persons desiring to deposit refuse in navigable waters will be required to obtain a permit from the Department of the Army. One who discharges wastes into such waters without a permit may be subjected to legal proceedings. When a District Engineer believes that a discharge has occurred having an adverse effect on water quality he shall notify the Regional Representative of the EPA. If the Regional Representative believes that there has been an adverse effect on water quality he shall submit a report to the District Engineer. If a refuse permit is suspended the District Engineer shall notify the Regional Representative. If legal action is deemed necessary the appropriate United States attorney should be notified. (Robinson-Florida)
W71-09700

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Coast Guard, Washington, D.C.

Federal Register, Vol 36, No 71, p 7009-7011 (Apr 1971). 3 p.

Descriptors: *Water pollution control, *Administrative agencies, *Oil wastes, *Government finance, Federal government, Legal aspects, Regulation, Administration, Administrative decisions, Water pollution, Water pollution treatment, Oil, Oily water, Water pollution sources, Water policy, Pollution abatement, Financing, Legislation.
Identifiers: *Water Pollution Control Act, *Water Quality Improvement Act.

Pursuant to the Federal Water Pollution Control Act, as amended by the Water Quality Improvement Act of 1970, the Commandant of the Coast Guard promulgates regulations dealing with control of pollution by oil and other hazardous substances. The Act provides for the establishment of a fund which may be used to pay the following: (1) costs for phase II and III actions under the National Contingency Plan; (2) judgments, compromises, and settlements; and (3) any other costs deemed proper by the Commandant. However, the fund may not be used to pay the costs of removing oil discharged from United States public vessels or facilities. Requests for payment must be made in accordance with the Regional Contingency Plan. Claims asserted shall be in accordance with the Federal Claims Collection Act of 1966. The Commandant shall deposit in the fund monies received by the United States from: (1) payment of fines under the Act, (2) payment of civil penalties under the Act, (3) payments as a result of demand for payment or in compromise or settlement of an action brought under section 11 (f) and (g) of the Act, and (4) payments in satisfaction of judgments obtained under the Act. (Robinson-Florida)
W71-09701

A BILL TO CONSENT TO THE INTERSTATE ENVIRONMENT COMPACT.

Senate Bill 907, 92d Cong., 1st Sess (1971). 10 p.

Descriptors: *Interstate compacts, *Environmental sanitation, *Water pollution control, *Pollution abatement, Legal aspects, Legislation, Federal government, State governments, Environment, Water pollution, Wastes, Waste disposal, Waste treatment, Water pollution treatment, Water policy, Water quality, Water quality control, Water treatment.

Because environmental pollution problems transcend state boundaries this bill would provide congressional consent for any two or more states to enter into the Interstate Environment Compact. Nothing in the Compact would impair or extend the Constitutional authority of any signatory state or the United States. Signatories would be authorized to participate with the federal government in interstate environmental protection. Other existing governmental arrangements not primarily directed to environmental protection would not be affected. Supplementary agreements may be made by the signatories. Nothing herein would diminish or supersede existing interstate compacts. This compact would not affect future multistate compacts not in conflict. Signatories would be allowed to enter into special supplementary agreements with the District of Columbia or foreign nations for the same purposes as those of the compact if the non-signatories accept the general obligations of the Compact. This Compact does not affect the authority of signatories to enact environmental legislation not inconsistent with it. The provisions of the Compact would be severable. States would be allowed to withdraw one year after written notice to the other signatories. Amendments would be effective when approved by all signatories and Congress. (Robinson-Florida)
W71-09702

GREAT LAKES BASIN CONSERVATION ACT (A BILL TO AMEND THE SOIL CONSERVATION AND DOMESTIC ALLOTMENT ACT TO PROVIDE FOR A GREAT LAKES BASIN CONSERVATION PROGRAM).
Senate Bill 1156, 92d Cong, 1st Sess (1971). 6 p.

Descriptors: *Soil conservation, *Water conservation, *Contracts, *Adoption of practices, Federal government, Economics, Erosion control, Land management, Land resources, Project purposes, Water resources development, Pollution abatement, Agricultural engineering, Farm management, Administrative agencies, Land use, Erosion, Government finance.

Under this proposed amendment to the Soil Conservation and Domestic Allotment Act, entitled the Great Lakes Basin Conservation Act, the Secretary of Agriculture is authorized to contract with landowners to share the cost of alterations in cropping systems and land use in order to conserve soil and water resources. The landowner furnishes the plan of farming operations, which should incorporate maximum practicable soil and water conservation principles, and outlines the schedule of proposed changes. The plan shall include measures for fish and wildlife conservation, promoting economic land use, and reducing agricultural pollution, to the extent practicable. Under the contract, the landowner must agree: (1) to effectuate the plan; (2) to forfeit further payments for breach; (3) to forfeit further payments upon alienation, unless the new owner assumes the contract obligations; (4) not to adopt practices contravening the plan; and (5) to accept additional provisions desired by the Secretary. By mutual agreement, the contract may be terminated. In addition, state and local conservation programs are to be considered in making the contract. (Hart-Florida)
W71-09703

DEEP OCEAN DUMPING OF BALED REFUSE.
US Government Printing Office, Washington, DC, National Industrial Pollution Control Council, Sub-Council Report (Feb 1971). 15 p.

Descriptors: *Cities, *Oceans, *Waste disposal, *Environmental effects, Degradation (Decomposition), Municipal wastes, Sanitary engineering, Sludge disposal, Federal government, Research and development, Wastes.

No comprehensive studies on the effect of refuse dumping on the ocean environment have been completed. Although a recent report points out the danger of continued uncontrolled dumping, it does not recommend development of systems for safe exploitation of the enormous absorptive capacity of the oceans. Furthermore, no long-term tests have been conducted on the behavior of municipal solid waste on the ocean floor which measure chemical or biological degradation rates or the effects of such wastes on the environment. The known serious offenders of ocean pollution are sewage sludge, industrial chemical waste, and oil spillage. Municipal refuse does not contain nutrients characteristic of sewage or toxic elements characteristic of industrial chemical wastes. Moreover, municipal refuse may be compressed into bales for depositing into deep ocean sites where biological activity is minimal. However, baled refuse might float initially or interfere with biological systems in the ocean. The United States should begin a series of experiments to develop acceptable methods for disposal of municipal refuse in the oceans to alleviate pressing municipal refuse problems. (Hart-Florida)
W71-09704

STATE CERTIFICATION OF ACTIVITIES REQUIRING A FEDERAL LICENSE OR PERMIT.
Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 36, No 90, p 8563-8565 (May 1971). 3 p.

Descriptors: *United States, *Water pollution control, *Standards, *Permits, Legal aspects, Regulation, Administrative agencies, Federal government, Water rights, Administration, Inspection, Water resources development, Water pollution effects, State governments, Environmental effects, Water conservation, Water quality control, Water resources, Pollution abatement, Water pollution sources, Water law.

Any applicant for a federal permit to conduct an activity that might result in any discharge into the navigable waters of the United States is required to obtain certification from the appropriate agency that the activity will not violate applicable water quality standards. The Regional Administrator of the Environmental Protection Agency shall review applications for permits and certifications to determine if discharges might affect the water quality of another state. If he determines that there would be such an effect, he shall notify the other state, which may object to the granting of the permit. The Administrator shall give certification when: (1) he has promulgated the applicable standards, or (2) the state has not delegated authority to give such a certification even though it has set up its own standards. Certification by the Regional Administrator shall be given only after proper notice and hearing. A Regional Administrator shall be allowed to inspect facilities certified in connection with issuance of a permit for construction. Any violation of the standards appearing at this inspection may be brought before the issuing agency to decide if the permit should be suspended. (Johnson-Florida)
W71-09705

CLEAN WATERS FOR AMERICA WEEK, 1971,
Richard M. Nixon.
Proclamation 4049, Federal Register, Vol 36, No 86, p 8289-8290 (May 1971). 2 p.

Descriptors: *United States, *Water pollution, *Water policy, *Water resources development, Legal aspects, Federal government, Social aspects, Environmental effects, Natural resources, Water resources, Water utilization, Water quality, Water treatment, Water pollution treatment, Pollution abatement, Water quality control, Water shortage, Water requirements.

One of America's greatest challenges in the 1970s will be ending the wasteful and destructive practices which have so seriously degraded our environment. Americans have taken our natural resources for granted, confident that our land would provide enough good water for every need. The truth is that we have uncovered no new sources of fresh water for many years. At the same time, population growth and technological advances have tremendously increased both the overall and the per capita consumption of water, while inadequate treatment of wastes has contaminated more and more of our water resources. Quick and effective action is required to protect our waters from further deterioration and to treat wastes so that water may be used again. President Nixon designates the week beginning May 2, 1971, as Clean Waters for America Week. All Americans are urged to observe this week with appropriate ceremonies, activities, and educational programs. We are also encouraged to support governmental efforts to clean up our national waterways and to adopt new habits and practices which will contribute to the enhancement of water quality in this country. (Johnson-Florida)
W71-09706

BASS ANGLER SPORTSMAN SOC'Y V UNITED STATES STEEL CORP (PRIVATE PARTY LACKS RIGHT TO ENFORCE ANTI-POLLUTION PROVISIONS OF RIVERS AND HARBORS ACT).
324 F Supp 412-417 (D Ala 1971).

Descriptors: *Alabama, *Rivers and Harbors Act, Pollution abatement, *Water pollution control, Water pollution, Water quality control, Navigable waters, Navigable rivers, Judicial decisions, Water law, Legal aspects, Remedies.

Plaintiff society sued various corporate and government defendants, seeking the imposition of fines for violation of the Rivers and Harbors Act of 1899 and to enjoin further violations. The Act proscribes dumping of refuse matter into navigable waterways and provides for imprisonment and fine, one half of which may be paid to the person giving information leading to conviction. Plaintiff contended that this latter provision entitled it to maintain an action to enforce the Act. On consolidated hearing, the United States District Courts for the Northern, Middle, and Southern Districts of Alabama granted defendants' motions to dismiss. The courts held that a private party had no right to enforce a criminal fine by civil action, and that injunction is not the proper remedy for enforcement of the criminal law. (Madsen-Florida)
W71-09707

ENVIRONMENTAL DEFENSE FUND INC V CORPS OF ENGINEERS (INJUNCTION HALTING CONSTRUCTION OF BARGE CANAL).
324 F Supp 878-883 (DDC 1971).

Descriptors: *Florida, *Canal construction, *Environmental effects, *Ecosystems, Balance of nature, Water pollution, Wildlife conservation, Water conservation, Aesthetics, Scenery, Water pollution effects, Ecology, Rivers, Natural resources, Water resources development, Recreation, Hunting, Fishing, United States, Federal government, Organizations, Administrative agencies, Legislation, Adjudication procedure, Legal aspects, Judicial decisions.
Identifiers: *Cross-Florida Barge Canal.

Plaintiff conservationist organizations sought preliminary injunctive relief against the Army Corps of Engineers to prevent further construction on the Cross-Florida Barge Canal. Plaintiffs contended that the Canal was being built in violation of statutes designed to preserve natural resources, and that unless the relief was granted, irreparable damage would result to the Oklawaha River ecosystem, including destruction of wildlife and water pollution. Defendant contended that plaintiffs lacked standing to sue, that the government was immune through the doctrine of sovereign immunity, and that the statutes did not apply to the Canal. The United States District Court, in granting the preliminary injunction, noted that public conservationist groups have a sufficient interest in environmental values to have standing to sue as representatives of the public interests involved. The doctrine of sovereign immunity was inapplicable because plaintiffs alleged that the government was acting beyond its statutory authority and that the exercise of authority was constitutionally void. Plaintiffs sufficiently alleged violations of various statutes designed to protect the environment. Further work on the Canal was temporarily halted to prevent irreparable harm to the environment. (Smiljanich-Florida)
W71-09708

TOWARD A CONSTITUTIONALLY PROTECTED ENVIRONMENT.

Virginia Law Review, Vol 56, p 458-486 (1970). 29 p, 124 ref.

Descriptors: *Legal aspects, *Judicial decisions, *Environment, *Public rights, Legislation, Adjudication procedure, Rivers and Harbors Act, Water Quality Act, Federal government, State governments, Public health.
Identifiers: *Constitutionality.

The recent public awareness of environmental degradation has generated a search for a constitutional means of protecting the environment. Although no express constitutional provision protects the environment, the Supreme Court in Griswold v. Connecticut found a constitutional right to privacy in the penumbra of the Bill of Rights, or as part of the due process clause. Constitutional protection of the environment might be found as in Griswold, through interpretation of the Ninth Amendment. Also, environmental rights could be recognized as another facet of the developing 'right to be let alone', expanding the scope of individual constitutional protection to include integrity of natural surroundings. The public's environmental rights have also been protected through court construction of federal legislation. Although a constitutional right to an environment cannot be explicitly defined, the public should be protected from 'unreasonable' environmental degradation. Three obstacles exist to asserting the right of environmental protection: (1) state action within 42 U.S.C. 1983; (2) lack of justiciability of the controversy; and (3) difficulty in framing an adequate decree. Judicial recognition of constitutional environmental rights is necessary for effective environmental protection. (Hart-Florida)
W71-09709

THE 'FINAL' WATER WELL LAW AND REGULATIONS,
National Water Well Association, Urbana, Ill. Manufactures Div.
D. Fumes.
Water Well Journal, Vol 20, No 1, p 57-68, January 1966, 1 tab.

Descriptors: *Legislation, *Well regulations, *Water wells.
Identifiers: *Water well construction standards, Pump installation standards, Water well construction and pump installation act, Abandoned wells, Grouting, Disinfection.

The water well industry, in general, is under increasing pressure. It has been told that individual wells are 'unsafe' offer a health hazard.....are not regulated and supervised like central water supplies. The author admits that to some extent the accusations are true. Few states have effective licensing laws to keep practices at a high level. Even fewer states have effective control over how wells are constructed or how pumps are installed. It is to put an end to such charges that the water well law was developed. It is designed to protect public health. The sponsors feel that it will up-grade our industry by forcing contractors to meet higher standards than are sometimes the case and by forcing all contractors to do an adequate job. The law should benefit both the public and the well contractor. The law was developed by the Industry Committee for Private Water Resource Protection and was sponsored by the American Institute, Central Supply Association, National Water Well Association and the Water Systems Council. The laws represents a consensus reached by over 100 drilling contractors, pump installers throughout the country and has been endorsed by the Public Health Service, the Conference of State Sanitary Engineers and the American Public Health Association. (Campbell-NWWA)
W71-09723

WYOMING WATER AND THE MINERAL INDUSTRY, THE LAW, THE PROBLEMS, AND SOURCES OF INFORMATION,
Wyoming State Engineer's Office, Cheyenne.
S. H. Ross.
22nd Annual Field Conference - September 21-23, 1970, Casper, Wyoming: Wyoming Geological Association Guide Book, 292 p.

Descriptors: *Wyoming, *Legislation, Groundwater, Drilling, *Water wells, Waste disposal.
Identifiers: *Mining industry, Water rights, Pollution, Solution mining potential pollution.

Because of an ever-increasing interest in Wyoming's water resources, especially groundwater resources, this paper has been written to acquaint water users (and potential water abusers)

with this vital resource. Emphasis is on (1) the history of water usage and water legislation; (2) water laws as they apply to industry, especially the extractive mineral industry, today; (3) problems caused by continued exploitation of both groundwater and mineral resources that lie within and below usable groundwater deposits; and (4) sources of information on groundwater in Wyoming. This paper is especially well written and well referenced. (Campbell-NWWA)
W71-09727

THE VALUE OF STATE GROUNDWATER AGENCIES TO THE SMALL WATER WELL CONTRACTOR,
Ohio Div. of Water, Columbus.
A. C. Walker.
Groundwater, Vol 1, No 1, p 4-7, January 1963, 12 fig.

Descriptors: *Water wells, Groundwater, Drilling.
Identifiers: *State groundwater agencies, *Water well contractor, Cooperation, Pollution control well logs, Information exchange.

It is the State's responsibility to see that its groundwater resources are developed with as little 'red tape' as possible. The well driller's responsibility is to his customers. Both State groundwater agencies and water well drillers can carry out their responsibilities best by working together. Such cooperation can eliminate unnecessary drilling regulations and result in better wells through exchange of information. In many instances, overdevelopment or contamination of an aquifer could have been avoided if drillers and States had worked together, rather than in opposite directions. (Campbell-NWWA)
W71-09728

REGULATIONS PERTAINING TO ISSUANCE OF A PERMIT.
Missouri Water Pollution Board.

Missouri Water Pollution Board, Jefferson City, 65101 (1967). 5 p.

Descriptors: *Missouri, *Permits, *Administrative agencies, *Regulation, Control, Water pollution control, Inspection, Testing, Industrial wastes, Sewage treatment, Water treatment, Administration, Pollution abatement, Water pollution treatment, Water quality control, On-site investigation, Sewage disposal, Treatment facilities, Waste water treatment, Waste treatment, Water policy.

The Water Pollution Board is empowered to issue permits to all persons operating any system for the collection, treatment, or disposal of sewage, industrial waste or other waste into the waters of the state. Permits shall specify the conditions at the time of issuance and shall be designed to carry out the purposes of the State Water Pollution Act. No person shall erect, modify, commence, or operate any such system without first securing the appropriate construction or operating permit from the Board. Construction permits are granted only after the Board has examined and approved both the preliminary engineering report and the final plans for operation. Operating permits are granted after examination by the Board to determine that the completed work adheres to the approved plans. All plants shall be inspected periodically by representatives of the Board. (Horwitz-Florida)
W71-09744

CURRENT CONSERVANCY LEGISLATION,
Iowa House of Representatives, Des Moines.
For primary bibliographic entry see Field 05G.
W71-09762

POLLUTION CONTROL DECISIONS - WHO SHOULD MAKE THEM,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-09763

NAVIGABLE WATERS POLLUTION CONTROL ACT OF 1965 (A BILL TO PROVIDE FOR THE ESTABLISHMENT OF REGULATIONS FOR THE PURPOSE OF CONTROLLING POLLUTION FROM VESSELS AND OTHER SOURCES IN THE NAVIGABLE WATERS OF THE UNITED STATES).

Senate Bill 1908, 89th Cong, 1st Sess (1965). 12 p.

Descriptors: *Navigable waters, *Water pollution control, *Ships, *Regulation, Administrative agencies, Water pollution, Water quality, Water quality control, Legislation, Oil, Legal aspects, Oily water, Waste disposal, Wastes, Pollution abatement, Abatement.
Identifiers: *Refuse Act of 1899, *Oil Pollution Act.

The Navigable Waters Pollution Control Act of 1965 proposed in this Senate bill endeavors to expand and improve existing law and provide authority to establish regulations controlling pollution in navigable waters of the United States. Various administrative agencies are authorized to establish regulations concerning equipment and facilities and treatment and disposal of oil, sewage, and refuse from vessels in navigable waters of the United States. The Coast Guard is responsible for implementing the regulations. A technical committee will be appointed to formulate the regulations. The 1924 Oil Pollution Act is amended by providing new definitions, making discharge of oil unlawful except during emergencies, and establishing liability for removal of all oil discharged. Penalties for violation are prescribed. The Coast Guard may suspend or revoke licenses for violation of the Act. The 1961 Oil Pollution Act is amended making violation of certain provisions a misdemeanor and establishing penalties. Enforcement of its provisions will also be by the Coast Guard. The Refuse Act of 1899 is amended to provide that the Coast Guard shall administer its provisions. (Hart-Florida)
W71-09766

DOW SUED BY ONTARIO FOR POLLUTION DAMAGE.
For primary bibliographic entry see Field 05C.
W71-09784

A BILL TO AMEND THE INTERNAL REVENUE CODE OF 1954 TO ENCOURAGE THE ABATEMENT OF WATER AND AIR POLLUTION BY PERMITTING AMORTIZATION OF THE COST OF ABATEMENT WORKS.

Senate Bill 1670, 89th Cong, 1st Sess (1965). 8 p.

Descriptors: *Taxes, *Pollution abatement, *Water pollution control, *Amortization, Air pollution, Water pollution, Administrative agencies, State governments, Federal government, Legal aspects, Non-structural alternatives, Financing, Depreciation, Facilities.

Abatement of air and water pollution would be encouraged under this Bill, which adds section 183 to the internal Revenue Code of 1954, by permitting amortization of the cost of abatement works over a 36 month period. Any taxpayer may elect to amortize abatement works on the straight-line method not later than the time for filing in the year in which the Secretary of Health, Education, and Welfare (HEW) certifies the abatement works. Performance standards for abatement works will be established by HEW. When the state certifying authority has certified to HEW that state standards have been met, and HEW has certified to the Secretary that minimum HEW standards are satisfied, the works qualify for amortization. However, HEW may not certify works for the extent to which the profits from abatement works will be sufficient to recover its cost over its actual useful life. The basis of abatement works shall be allocated between certified and non-certified portions of the works. Other sections of the Code are modified as required. (Hart-Florida)
W71-09785

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT IN ORDER TO ESTABLISH A PROGRAM TO DECREASE WATER POLLUTION BY SYNTHETIC DETERGENTS.
Senate Bill 1479, 89th Cong, 1st Sess (1965). 5 p.

Descriptors: *Pollution abatement, *Water pollution control, *Detergents, *Degradation (Decomposition), Water pollution sources, Water quality, Water quality control, Soaps, Chemical wastes, Domestic wastes, Legislation, Administrative agencies, Pollutants, Administrative decisions, Administration, Federal government, Regulation.

A program to decrease water pollution caused by use of synthetic detergents which do not decompose or which decompose slowly would be established by this proposed amendment to the Federal Water Pollution Control Act. Efforts to develop fast-decomposing detergents are encouraged through liaison with detergent manufacturers. Standards of bio-degradability will be developed by the Secretary of Health, Education and Welfare, with the assistance of a technical committee composed of members from various sources. The decomposability standards will be developed from tests simulating municipal sewage treatment and household waste treatment. The Secretary is authorized to promulgate rules prohibiting sale or transport in interstate commerce of detergents failing to meet the decomposability standards. Furthermore, rules may be established which prohibit importation of detergents not meeting the standards. Violation of these rules is a misdemeanor, punishable by fine. (Hart-Florida)
W71-09786

ESCAROSA: A PRELIMINARY STUDY OF COASTAL ZONE MANAGEMENT PROBLEMS AND OPPORTUNITIES IN ESCAMBIA AND SANTA ROSA COUNTIES, FLORIDA.
Florida Coastal Coordinating Council, Tallahassee.
For primary bibliographic entry see Field 02L.
W71-09794

1970 REPORT OF THE INTERSTATE SANITATION COMMISSION.
Interstate Sanitation Commission, New York.
For primary bibliographic entry see Field 05G.
W71-09801

YEAGER V CITY OF PITTSBURGH (NEGLIGENCE IN MAINTAINING OPEN SEWER).

103 Pa Sup Ct 34, 157 A 353-354 (1931).

Descriptors: *Pennsylvania, *Drainage systems, *Storm runoff, *Water injury, Costs, Judicial decisions, Legal aspects, Water law, Structures, Sewers, Open channels, Sewage disposal, Cities, Local governments, Surface runoff, Floods, Rainfall, Water control, Flood control, Overflow, Environmental effects, Storms, Flood damage, Damages.

Plaintiff owned property which was bounded by Beck's Run. Defendant city maintained the run as an open sewer to carry off both storm or surface water and sanitary sewage. The average depth some years before this action had been six feet and had been sufficient to carry off all the water discharged into it. Plaintiff's house, cellar, and garden were flooded after a severe storm. Plaintiff brought suit, alleging that defendant had negligently maintained its sewer, permitting the bed of the run to become filled up with sand and debris so that the normal depth of the run was reduced to two feet or less. The trial resulted in a jury verdict for plaintiff and the Superior Court of Pennsylvania found that there was sufficient evidence to support the verdict. The court stated that when a city uses a stream or water course as an open sewer, it assumes the duty of keeping it clear of obstructions. If, after adequate notice, it permits the channel to become obstructed, with resulting

damage to neighboring property, it must respond in damages for the tort. (Johnson-Florida)
W71-09828

GUNDY V VILLAGE OF MERRILL (CITY'S RESPONSIBILITY FOR NUISANCE CREATED BY OPEN DRAINAGE OF SEWAGE).
250 Mich 416, 230 NW 163-164 (1930).

Descriptors: *Michigan, *Sewage disposal, *Drainage systems, *Waste water (Pollution), Judicial decisions, Legal aspects, Municipal wastes, Cities, Waste disposal, Sewage, Wastes, Sewerage, Sewers, Drainage, Drainage practices, Damages, Remedies, Waste water disposal.

Plaintiff landowners sued defendant city and defendant creamery company seeking damages and an injunction. An outlet of the village sewer emptied into an open drain which crossed plaintiff's land. The creamery company also deposited wastes therein. Defendants claimed that the drain was a county drain and that the city had no duty or jurisdiction over it. Defendants further argued that plaintiff had lost his right to complain by prescription, and that plaintiff had contributed to the problem by allowing weeds to grow in the drain. The trial court granted no damages but ordered the nuisance abated within 60 days. The Supreme Court of Michigan modified the judgment by allowing the defendants an extension of time in which to abate the nuisance. A municipality has no right to deposit sewage into an open drain if it will cause a nuisance, nor can prescriptive rights to maintain a public nuisance be acquired. (Robinson-Florida)
W71-09869

SHELBY LOAN AND TRUST CO V WHITE STAR REFINING CO (LIABILITY FOR POLLUTION OF LAKE).
271 Ill App 266-269 (1933).

Descriptors: *Illinois, *Lakes, *Oil industry, *Water pollution, Water pollution sources, Water pollution effects, Water pollution control, Pollutants, Pollution abatement, Oil, Water quality, Water quality control, Legal aspects, Judicial decisions.

Plaintiff riparian landowner sought to enjoin defendant petroleum refining company from polluting a lake on plaintiff's property. Defendant discharged various chemicals and petroleum refuse into surface water which flowed naturally into plaintiff's lake. Defendant contended, however, that it maintained a purifying system, and that therefore the pollution of plaintiff's lake did not result from its discharges. Defendant also asserted that two other companies caused pollution of plaintiff's lake. The Illinois Appellate Court determined that defendant caused at least part of the pollution and stated that defendant would not be relieved of liability because others contributed. A defense of laches was also rejected. Defendant also contended that a permanent injunction would confer no substantial benefit upon plaintiff, while seriously injuring defendant. Nevertheless, the court affirmed the injunction issued by the trial court. (Hart-Florida)
W71-09882

DELAWARE RIVER BASIN COMMISSION RULES OF PRACTICE AND PROCEDURE AND BASIN REGULATIONS--WATER QUALITY.
Code of Federal Regulations, Title 18, Chap III, parts 401 and 410 (1970). 12 p.

Descriptors: *Delaware River Basin Commission, *Regulation, *Delaware River, *Water quality, Administrative agencies, Administrative decisions, Adoption of practices, Water resources, Water resources development, Interstate rivers, River basins, Administration.

The rules of practice and procedure of the Delaware River Basin Commission are in six subparts; subpart A contains rules governing the submission, consideration, and inclusion of projects in the comprehensive plan for the development of river basin resources. Subpart B describes procedures governing the submission, consideration, and inclusion of projects into the water resources program. Subpart C prescribes rules providing for commission approval before inclusion in the comprehensive plan of any project having a substantial effect on basin water resources. Subpart D provides rules of practice and procedure for review in water quality cases. Provisions for conduct of hearings are delineated in subpart E, including provisions governing staff and expert testimony, record of proceedings, and findings and reports. Subpart F contains general provisions for definitions of words used in the Compact, waiver of rules, and construction of the Compact. The second portion of the regulations, entitled 'Basin Regulations-Water Quality', incorporates by reference provisions previously adopted by the Commission for establishment and enforcement of water quality standards. (Hart-Florida)
W71-09898

6F. Nonstructural Alternatives

FLOOD DAMAGE ABATEMENT STUDY FOR VIRGINA,
Virginia Polytechnic Inst., Blacksburg. Water Resources Research Center.
William R. Waker.
Available from the National Technical Information Service as PB-200 657, $3.00 in paper copy, $0.95 in microfiche. Virginia Water Research Center Bulletin 10, Apr 1971. 293 p, 19 fig, 38 tab, 8 append. OWRR Project A-006-VA (1).

Descriptors: *Floods, *Flood damage, *Virginia, *Flood plain zoning, *Legislation, Non-structural alternatives, Cost-benefit analysis, Water resources development, Urbanization, Flood protection, Channel improvement, River training, Regulation, Flood plain insurance, Flood control, Land use, Zoning.
Identifiers: *Flood damage abatement.

This study gives a quick review of the national flood problem, a comprehensive review of the problem in Virginia, an identification of various programs which have attempted to meliorate flood damages, and two major pieces of legislation recommended to be adopted for further progress in flood damage abatement. Floods are too big a problem to be handled piecemeal. Only when we shift from simply reacting to them to actually planning for them can we expect to make headway in reducing flood damage losses. (Knepp-USGS)
W71-09467

FLOOD PLAIN INFORMATION, LENOIR, NORTH CAROLINA, LOWER CREEK, BLAIR FORK, LONG BRANCH, ZACKS FORK CREEK AND ZACKS FORK BRANCH.
Corps of Engineers, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W71-09600

FLOOD PLAIN INFORMATION, MORGANTON, NORTH CAROLINA - VOLUME 2. CATAWBA RIVER, SILVER CREEK AND BAILEY FORK.
Corps of Engineers, Charleston, S.C.
For primary bibliographic entry see Field 04A.
W71-09845

FLOOD PLAIN INFORMATION, ALBUQUERQUE ARROYOS, PART 1, ALBUQUERQUE, NEW MEXICO.
Corps of Engineers, Albuquerque, N. Mex.
For primary bibliographic entry see Field 04A.
W71-09846

6G. Ecologic Impact of Water Development

THE OAKLEY PROJECT--A CONTROVERSY IN LAND USE,
Illinois State Water Survey, Urbana.
William C. Ackermann.
Environmental Geology Notes, Illinois State Geological Survey, No 46, p 33-39, May 1971.

Descriptors: *Land use, *Conservation, *Social respects, *Flood control, Water resources development, Water supply.
Identifiers: *Metropolitan water problems, *Flood plain management, Environmental quality, Oakley Dam, Allerton Park, Decatur, Illinois Division of Waterways.

Plans are discussed for the proposed Oakley Dam, around which has developed a classic example of controversy in land and widely divergent social values. The Corps of Engineers proposes a dam downstream from Allerton Park (an estate owned by the University of Illinois) for flood control, water supply and recreation for Decatur, and storage for low-flow dilution of treated wastes. The project received great criticism because inumdation would ruin parkland, and construction cost estimates rose. A third party to the controversy is the city of Decatur, which has consistently been in strong support of the project because of an urgent water supply problem. The Illinois Division of Waterways has proposed a 'modified project' in order to bring the various parties together. The Committee on Allerton Park, a group of conservationists,has added to the controversy with publicity pointing to the destruction of bottom lands. It is hoped that a system will develop of weighing the environmental impacts as projects are being studied. (Wray-Chicago)
W71-09474

REPORT TO THE CONTRA COSTA COUNTY WATER AGENCY ON A STUDY OF THE EFFECTS OF THE PROPOSED FEDERAL SAN LUIS INTERCEPTOR DRAIN AND THE STATE SAN JOAQUIN VALLEY MASTER DRAIN.
Metcalf and Eddy, Inc., Palo Alto, Calif.

Oct 30, 1964. 93 p, 4 fig, 32 tab, 37 ref.

Descriptors: *Agricultural chemicals, *Deltas, *Drainage effects, *Water quality, *Farm wastes, *Industrial wastes, Municipal wastes, Nutrients, Pesticides, Recreation, Algae, Oxygen demand, Water pollution, Municipal water, Water requirements, Water conveyance, Water costs, Artificial water courses, California.
Identifiers: *Contra Costa County, Water deterioration, Drain, San Joaquin Valley Master Drain, San Francisco Bay-Delta.

The probable effects on the offshore waters of Contra Costa County, California by the proposed drain which will convey agricultural subsurface waste waters from the San Joaquin Valley and wastes from the San Luis Division of the Central Valley Project are discussed. The point of discharge would be the San Joaquin River in the vicinity of the Antioch Bridge. Discharge is expected to begin in 1969 at a rate of 75 cfs and increase to 900 cfs by 1995. Serious deterioration of the quality of offshore waters can be expected by 1975. Acquatic life and recreational use of the offshore waters could be seriously affected by the discharge of nutrients and pesticides from the drain. Nutrients are expected to have a greater effect than pesticides. The nutrients in the drain will produce growths of algae in the drain which by their death and decay will exert an oxygen demand in the river and bay varying from 7500 lbs per day in 1975 to 27,000 lbs per day in 1995. Industry and the City of Antioch will be able to use river water a lesser proportion of the time to satisfy high quality require-

ments. The discharge of the drain will have no significant effect on water for agricultural use. (Poertner)
W71-09577

BAY-DELTA WATER QUALITY SUBCOMMITTEE PRELIMINARY REPORT.
Sierra Club, San Francisco, Calif., San Francisco Bay Chapters.

June 1968. 24 p, 35 ref.

Descriptors: *Estuarine environment, *Bays, *Water quality, *Water pollution control, Water circulation, Water supply, Water demand, Saline water intrusion, Water conservation, Deltas, Thermal pollution, Agricultural chemicals, California.
Identifiers: *San Francisco Bay-Delta, *Sacramento-San Joaquin Delta.

The diversion of water is discussed from the San Francisco Bay-Sacramento-San Joaquin Delta estuarine system. Planned reductions in Delta outflow to a 1500 cfs minimum will promote salt water intrusion into Delta waterways. Inflow reductions will also adversely affect water quality within the Bay-Delta system. Upstream storage and diversion projects will probably reduce seasonal 'purging' flows to insignificance. Continued increasing discharge of human and industrial wastes into the system may overload its assimilative capacity, especially with reduced advective flows. The planned introduction of agricultural drainage wastes may have adverse effects on the region's aquatic ecology. Construction of a canal from the pumps to bypass the Delta is probably necessary to mitigate the effects of increased pumping on fishery and water quality. Peripheral Canal intake facilities may prove to be a severe handicap to migrating fish. The proposed widening and deepening of navigational channels may have possible adverse effects on water quality by allowing salt water to intrude below reduced fresh water outflows. Thermal pollution, although not discussed, may reduce oxygen content, alter marine biota, and interfere with migrating fish. Recommendations are presented to avert these problems. (Poertner)
W71-09578

CONTRA COSTA COUNTY AND THE PERIPHERAL CANAL,
Contra Costa County Water Agency, Martinez, Calif.
John A. Nejedly.
Statement before the Superior California Water Association, Red Bluff, Jul 10, 1968. 14 p.

Descriptors: *Deltas, *Water transfer, *Water rights, *Water resources, Costs, fisheries, Legislation, Industries, Agriculture, Municipal wastes, Recreation, Striped bass, California, Estuarine fisheries.
Identifiers: *Contra Costa County, *Peripheral Canal, Southern California, San Francisco Bay-Delta.

The statement presented the views of Contra Costa County on the proposed Peripheral Canal. The canal, a 43 mile closed conduit approximately 360 to 530 feet wide, 30 feet deep, with a maximum capacity of 22,000 cfs, will enable Federal and State water agencies to transport water from the Delta to Southern California. Contra Costa County is opposed to the project because complete control over the waters flowing into the Delta would be given to the Bureau of Reclamation and the Department of Water Resources. A study made by the Metcalf and Eddy engineering firm presents costs estimates. It is estimated that, by the year 2000, increased costs in the County resulting from the water export will be $2.2 million to industrial entities using Delta water, $1.8 million to the agricultural industry, $0.9 million for municipal water supplies, and $2 million in additional waste treatment costs, or a total of 6.9 million additional costs. Because of estimating difficulties, no dollar figures were placed on losses to the recreational and sport fishing industries. The County requires an agreement, that protects the Delta, which should be incorporated in a judgment by a court of competent jurisdiction and embedded in Congressional and State legislation. (Poertner)
W71-09579

STATEMENT OF THE BOARD OF SUPERVISORS OF CONTRA COSTA COUNTY REGARDING THE REPORT OF THE U.S. BUREAU OF RECLAMATION ON THE FEASIBILITY OF THE 'PERIPHERAL CANAL UNIT CENTRAL VALLEY PROJECT, CALIFORNIA'.
Board of Supervisors of Contra Costa County, Martinez, Calif.

Presented before the Senate Committee on Water Resources and the Assembly Committee on Water, Sacramento, California, September 17-18, 1969. Sep 10, 1969. 6 p.

Descriptors: *Deltas, *Estuarine environment, *Water transfer, *Balance of nature, *Canals, Sedimentation, Eutrophication, Flow characteristics, Water levels, Estuarine fisheries, Bays, California, Water conveyance, Diversion.
Identifiers: *San Francisco Bay-Delta, Contra Costa County, Peripheral Canal Unit, San Joaquin Valley.

The statement presented the viewpoint of Contra Costa County, California regarding a report prepared by the U.S. Bureau of Reclamation. That report, entitled 'Peripheral Canal Unit, Central Valley Project, California, A Report on the Feasibility of Water Transfer in the Sacramento-San Joaquin Delta', is concerned with a facility that will transfer water originating in the Sacramento River Basin and Delta to the San Joaquin Valley. Officials of Contra Costa County believe that the facility will alter the hydrology and, consequently, the economy, ecology and environment of the entire San Francisco Bay-Delta system. Contra Costa County has found the Bureau's report to be silent with respect to protection of the San Francisco Bay System. The County claims that this is a shortcoming which must be remedied before the report is approved by the Governor. Some of the areas of concern are: deposition of sediment, algal blooms in slow moving water, areas of poor water quality due to flow patterns, lowering of water levels, and accelerated eutrophication of shallower channels. (Poertner)
W71-09580

EFFECTS OF PLANNED FRESH WATER DIVERSIONS ON THE SAN FRANCISCO BAY AND SACRAMENT—SAN JOAQUIN ESTUARY,
California Univ., Davis. Dept. of Civil Engineering.
Ray B. Krone.
Report to the San Francisco Bay Conservation and Development Commission, May 21, 1970. 7 p, 1 fig.

Descriptors: *Deltas, *Bays, *Water quality, *Water pollution control, *Diversion, Sediments, Water circulation, Absorption, Nutrients, Pesticides, Algae, Dredging, Estuarine environment, California Water conveyance, Canals, Heavy metals.
Identifiers: *San Francisco Bay-Delta.

The effects are discussed of the planned diversion of fresh water flows and suspended sediments from the San Francisco Bay and Sacramento-San Joaquin Estuary. Sediment is carried into the Bay System with fresh water inflows. Bay sediments have three outstanding effects: they impair the penetration of light, they absorb tremendous amounts of toxic materials, and clog navigable waterways. The turbidity caused by suspended sediment materials limits the depth to which there is sufficient light for algae to multiply. Since nutrients for algae growth are plentiful in the bay, the limited light penetration due to sediment is the limiting factor to the rapid multiplication of algae in the Bay. The sediments also absorb toxic compounds, such as heavy metals, pesticides, and radioactive fallout. The only foreseeable benefit of the reduced sediments are reduced dredging costs. The report recommends that comprehensive studies be made of the reduced water and sediment inflows; that criteria be established as a basis for regulating fresh water diversion; that an adequate monitoring system be maintained; that the constituent levels and locations of waste discharges to the system be regulated; that new methods of treatment of waste waters for removal of nutrients and toxic materials be developed and supported. (Poertner)
W71-09581

REDUCED FLOWS AND THE FUTURE ECOLOGY OF THE BAY-DELTA SYSTEM,
California Univ., Davis. Dept. of Zoology.
Charles R. Goldman.
Report to the San Francisco Bay Conservation and Development Commission, May 21, 1970. 11 p, 1 fig.

Descriptors: *Deltas, *Bays, *Ocean circulation, *Eutrophication, *Wetlands, *Diversion, *Ecology, Saline water intrusion, Estuarine environment, Watershed management, Nutrients, Algal, Fisheries, Sediment, California, Water circulation.
Identifiers: *San Francisco Bay-Delta, Inorganic turbidity.

Ecological implications are summarized of reduced freshwater discharge into the San Francisco Bay-Delta system. A greater intrusion of salt water and a longer retention time for plant nutrients washed in from the Delta, or discharged into the Estuary, is one result. In addition, the quantity of suspended sediments entering the Delta will be reduced. These provide much of the present turbidity in the system. The inorganic sediment particles act to remove phosphorous and heavy metals by collecting on their surfaces and carrying them to the bottom. In all probability, the decrease in inorganic turbidity will be compensated for by a increase in planktonic algae--in response to higher nutrient levels, increased temperature, increase in light transmission, and the longer average retention time of a random unit of water in the system. Unless a very high percentage of the agricultural drainage, as well as domestic pollutants, are by-passed around the Delta to an ocean sewer outfall, we can expect a general eutrophication of the Delta. Synoptic studies of the entire Bay-Delta should be undertaken now to assess the variations in fertility already existing in order to provide a baseline knowledge for any future change that may take place. (Poertner)
W71-09582

COMPREHENSIVE WATERSHED MANAGEMENT-THE ANADROMOUS FISHERY RESOURCE,
Contra Costa Coll., San Pablo, Calif. Dept. of Biology.
Fred H. Tarp.
Report to the San Francisco Bay Conservation and Development Commission, May 21, 1970. 7 p, 1 fig.

Descriptors: *Deltas, *Bays, *Diversion, *Anadromous fish, *Fisheries, Estuarine environment, Eutrophication, Saline water intrusion, California, Striped bass, Salmon, Estuarine fisheries.
Identifiers: *San Francisco Bay-Delta, *Peripheral Canal, San Joaquin River, Sacramento River.

The San Francisco Bay-Delta anadromous fish are discussed along with the effects which will result if the proposed Peripheral Canal is built to export water to the San Joaquin Valley and the Los Angeles lowlands. Reduced flows into the Delta will result in salinity intrusion and the provisional rim-flow channels will markedly reduce the dead-end sloughs as a habitat. In addition, increased water transparency and possible temperature effects will affect survival. The andromous fisheries resource

of the Bay-Delta estuarine system consists of Striped Bass, King Salmon, Steelhead Trout, Shad, and Sturgeon. At present, the species are endangered by artificial eutrophication, biocides, and toxicants as they pass through the estuarine system in their migrations. The effects of these factors will be aggravated by water export which is the principal operating force responsible for the destruction of environments of anadromous species. There are many gaps in present knowledge of physicochemical and dynamic parameters of species in the Delta. It will take at least ten years of intensive study to fill in the present gaps. (Poertner)
W71-09583

STATEMENT OF THE BOARD OF SUPERVISORS OF CONTRA COSTA COUNTY, REGARDING EFFECT OF REDUCED OUTFLOW UPON THE SAN FRANCISCO BAY-SACRAMENTO-SAN JOAQUIN DELTA ESTUARINE SYSTEM.
Board of Supervisors of Contra Costa County, Martinez, Calif.

Presented before the Senate Select Committee on Salinity Intrusion in Agricultural Soils; San Francisco Bay-Delta Area Fact Finding Hearing, November 18-19, 1970, Martinez, Nov 17, 1970. 20 p, 2 fig.

Descriptors: *Saline water intrusion, *Tidal effects, *Estuarine environment, *Deltas, *Water pollution control, Discharge (Water), Stratified flow, Sedimentation, Estuarine fisheries, Farm wastes, Industrial wastes, Municipal wastes, Bays, Ocean circulation, Striped bass, California.
Identifiers: *San Francisco Bay-Delta, Contra Costa County, Peripheral Canal.

The proposed export is discussed of San Francisco Bay-Sacramento-San Joaquin Delta water to the southern portion of the state by the Federal Central Valley Project Pumping Plant at Tracy, and the State Water Project Delta Pumping Plant. The reduced Delta outflow could cause serious and drastic effects on the environment by way of salinity intrusion deeper into the Delta and by creating a potential for massive algal blooms. This would have a drastic adverse effect upon the natural and economic resources of the Bay-Delta System. The most important effect on the Delta's migratory fishery resulting from reduced Delta Outflows would be the deterioration of the spawning grounds of the striped bass which can only spawn in fresh water. Any deterioration of the Delta's fishery causes an ancillary adverse effect on the recreational industry. The 'Kaiser Report' emphasized that even with a high degree of treatment provided for all municipal and industrial waste dischargers to the Bay-Delta System, adequate flow of water through the system for flushing purposes is still required. Regarding legislation in this field, the salinity control function of the Central Valley Project and the State Water Project must be fully clarified before other legislation is written. (Poertner)
W71-09584

WATER RESOURCES PROBLEMS AND OPPORTUNITIES ASSOCIATED WITH MULTIPLE-PURPOSE IMPOUNDMENTS,
For primary bibliographic entry see Field 05G.
W71-09633

TOWARD A CONSTITUTIONALLY PROTECTED ENVIRONMENT.
For primary bibliographic entry see Field 06E.
W71-09709

A COMPREHENSIVE STUDY OF SAN FRANCISCO BAY,
California. University of Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 05A.
W71-09790

07. RESOURCES DATA

7A. Network Design

STATISTICAL LIMITS OF ACCURACY AND PRECISION OF GROSS ALPHA AND BETA RADIOACTIVITY MEASUREMENTS IN WATER,
Northeastern Radiological Health Lab., Winchester, Mass.
For primary bibliographic entry see Field 05A.
W71-09626

NATIONAL MONITORING PROGRAM FOR THE ASSESSMENT OF PESTICIDE RESIDUES IN WATER,
Geological Survey, Arlington, Va; and Environmental Protection Agency, Washington, D.C.; and Water Quality Office, Athens, Ga.
For primary bibliographic entry see Field 05A.
W71-09802

7B. Data Acquisition

RADIATION SURVEILLANCE NETWORK.
Division of Operational Safety (AEC), Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-09489

AIRBORNE MEASUREMENTS OF THE TOTAL HEAT FLUX FROM THE SEA DURING BOMEX,
California Univ., San Diego, La Jolla; Scripps Institution of Oceanography, La Jolla, Calif.; and Atlantic Oceanographic and Meteorologic Labs., Miami, Fla.
E. D. McAlister, William McLeish, and Ernst A. Corduan.
Journal of Geophysical Research, Vol 76, No 18, p 4172-4180, June 20, 1971. 9 p, 1 fig, 5 tab, 2 ref. NSF Grants GA-1491 and 11975.

Descriptors: *Heat balance, *Sea water, *Remote sensing, *Infrared radiation, Solar radiation, Heat budget, Heat flow, Meteorology, Water temperature, Convection, Heat transfer.
Identifiers: *Heat flux (Sea water).

Airborne measurements of the total heat flux from the sea were successfully made during the Barbados oceanographic and meteorological experiment in May 1969. The values found at night ranged from 0.05 to 0.45 cal per sq cm per min and are half-hour averages over contiguous strips of ocean 1.6 km km and 75 meters wide. These are the first airborne measurements of this oceanic factor and the method used is new. (Knapp-USGS)
W71-09602

TWO-STAGE METHOD OF PUMPING BY NEGATIVE PRESSURE,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 08C.
W71-09612

MECHANICAL SAMPLER FOR DETERMINING THE WATER QUALITY OF EPHEMERAL STREAMS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.
For primary bibliographic entry see Field 05A.
W71-09613

A GAMMA ATTENUATION UNIT AND LOGISTIC SYSTEM FOR MONITORING WATER CONTENT OF LARGE SOIL COLUMNS,
North Dakota State Univ., Fargo. Dept. of Soils.
D. K. Cassel, and D. R. Nielsen.
Water Resources Research, Vol 7, No 3, p 731-733, Jun 1971. 3 p, 2 fig, 4 ref.

Descriptors: *Nuclear moisture meters, *Soil moisture meters, *Equipment, *Automation, Monitoring, Cores, Sampling, Soil moisture, Gamma rays, Bulk density.
Identifiers: *Soil cores.

A gamma radiation attenuation unit was designed to monitor water content of large cores of natural soil. A logistic system was developed that allows one person easily to manuever and monitor soil cores as large as 1 foot in diameter and 3 feet in height. (Knapp-USGS)
W71-09614

THE DIFFERENTIAL THERMAL ANALYSIS OF FLOCCULATED CLAY SAMPLES,
Salford Univ. (England).
For primary bibliographic entry see Field 02J.
W71-09641

PREDICTING EARTHQUAKES BY HYDROGEOLOGICAL METHODS (Russian: K prognozirovaniyu zemletryasenij gidrogeologicheskim metodami),
I. G. Kissin.
Sovetskaya Geologiya, No 3, p 118-120, March 1970. 3 p, 7 ref.

Descriptors: *Earthquakes, *Seismic studies, *Groundwater, *Aquifer characteristics, *Seismic properties, Stress analysis, Borehole geophysics, Hydrogeology, Forecasting, Hydrodynamics, Pressure head, Piezometry, Deformation.
Identifiers: *USSR, Tashkent, Tectonics, Tectonic stress, Geostatic pressure, Epicenters, Focus, Hydrochemistry.

Gradual accumulation of stress in the region of earthquake focus affects pressures in the strata and, consequently, groundwater pressure heads. The prediction of earthquakes from hydrogeological data is dependent upon the fixed relationship between changes in stress in the region of focus at various stages of the process preceding an earthquake and the reaction of the 'borehole-aquifer' system. Aquifers are most susceptible to changes in stress in the region of potential focus. The most important factor influencing the groundwater in zones of hydrodynamic anomalies is the effect of geostatic pressure and tectonic stress on fluids. The effectiveness of hydrogeological observations of stress will depend upon the hardness of rocks making up the aquifers and impervious beds, the piezoconductivity of aquifers, the depth of focus, and the intensity of the tectonic processes. Although stress studies are being conducted in regions of potential foci by observations of groundwater pressure heads, the hydrodynamic method requires verification and should be used in combination with other methods dealing with variations in geophysical fields in seismic regions. (Josefson-USGS)
W71-09643

GROUND OBSERVATIONS AND UTILITY EVALUATIONS OF SPACE AND HIGH-ALTITUDE PHOTOGRAPHY, EASTERN ARIZONA,
Raytheon Co., Alexandria, Va. Autometric Operation.
Cecil D. Sapp, Gordon E. Howard, and Burton C. Becker.
For sale by the Superintendent of Documents, US Government Printing Office, Wash, DC 20402--Price 75 cents. Department of the Interior, EROS Program Report, July 1970. 23 p, 35 fig, 3 tab, 15 ref. Dept of Interior, EROS Program Contract 14-08-0001-12064.

Descriptors: *Aerial photography, *Remote sensing, *Infrared radiation, *Water resources, *Arizona, Aircraft, Instrumentation, Methodology, On-site investigations, Photogrammetry, Surface

waters, Topography, Hydrology, Geology, Solids, Vegetation.
Identifiers: *High altitude photography, Imagery simulation.

Ground observations of selected features from Earth Resources Technology Satellite imagery, high-altitude aircraft, and Apollo 9 multispectral photography were made over lands under Department of the Interior administration in eastern Arizona. The field work is supplemental to an earlier effort dated May 1970. The data is compared to that which was found in field investigations. The Safford area is drained primarily by the Gila River, which usually has only a trickle of water in its course during the summer. The black and white infrared photo showed some water present during the overflights. Water contrasts extremely well in the infrared. It is a good absorber and appears very black in relation to the generally light gray background. Numerous detention structures were detected on the photography, even though no water was present behind them. The Goat Well Detention Dam, located west of the Whitlock Mountains, is a curved structure 1 mile long. The June visit to the area found all tanks and detention structures to be devoid of water. Some springs were seen, and one well more than 2,800 feet deep was spurting forth water at about 120 deg F. (Woodard-USGS)
W71-09654

CASING DETECTOR AND SELF-POTENTIAL LOGGER,
Wisconsin State Univ., Superior.
For primary bibliographic entry see Field 08A.
W71-09724

DIRECT CONDUCTANCE METHOD OF MEASURING CASING LENGTHS,
Idaho Bureau of Mines and Geology, Moscow; and Adco Drilling and Research, Inc., Lewiston.
For primary bibliographic entry see Field 08A.
W71-09725

MICROTIME MEASUREMENTS OF GROUNDWATER LEVEL FLUCTUATIONS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02F.
W71-09732

PACKER TESTING IN WATER WELLS NEAR SARASOTA, FLORIDA,
U.S. Geological Survey, Sarasota, Fla. Water Resources Div.
For primary bibliographic entry see Field 08A.
W71-09734

PRACTICAL REMOTE SENSING, THE USE OF A THERMAL MAPPER IN STUDIES OF COOLING WATER DISCHARGES FROM OPERATING THERMAL POWER PLANTS,
Pacific Gas and Electric Co., Emeryville, Calif.
M. J. Doyle, Jr., and Vern W. Cartwright.
American Congress on Surveying and Mapping Annual Convention, American Society of Photogrametry, March 10-14, 1969, Washington, D.C.

Descriptors: *Thermal pollution, *Mapping, Remote sensing, Surveying instruments, Temperature, Infrared radiation, Thermal powerplants, Thermal radiation, Isotherms, Estuaries, Water pollution sources.

The use of a thermal mapper in determining the extent of cooling water discharges from operating thermal power plants is discussed. A basic description of the mapper, its output and ground truth methods are included. Application of computer data reduction techniques to thermal mapper output provides a comprehensive representation of the surface makeup of the discharged cooling waters. A method of subsurface measurement and the development of data analysis techniques designed to yield a better understanding of the mechanics of thermal discharges is presented. The airborne remote sensing instruments have been used for the study of surface waters adjacent to operating thermal power plants. The thermal mapper used in these studies was a Bendix Model TM/LN-1. (Novotny-Vanderbilt)
W71-09780

EVALUATING OIL SPILL CLEANUP AGENTS. DEVELOPMENT OF TESTING PROCEDURES AND CRITERIA,
California State Water Resources Control Board, Sacremento.
For primary bibliographic entry see Field 05G.
W71-09789

UTILITY OF RADIOISOTOPE METHODOLOGY IN ESTUARY POLLUTION CONTROL STUDIES. PART I. EVALUATION OF THE USE OF RADIOISOTOPES AND FLUORESCENT DYES FOR DETERMINING LONGITUDINAL DISPERSION COEFFICIENT IN ESTUARIES.
Quirk, Lawler and Matusky Engineers, New York.
For primary bibliographic entry see Field 05B.
W71-09791

A CONSTANT GEOMETRY APPROACH TO in situ SEABED GAMMA MONITORING,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 05A.
W71-09798

FLUORESCENT DYES, THEIR UPTAKE AND TANSLOCATION IN PLANTS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 02I.
W71-09815

7C. Evaluation, Processing and Publication

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1970,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 02E.
W71-09627

GROUNDWATER DATA AS OF 1967--CENTRAL COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
J. S. Bader.
Geological Survey Open-file Report, March 5, 1969. 16 p, 1 fig, 30 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Water table, Water level, Water yield, Reviews, Specific capacity, Withdrawal, Pumping, Groundwater recharge, Water temperature, Water quality, Dissolved solids, Chemical analysis, Water resources development.
Identifiers: *Groundwater resources.

Most usable groundwater in the predominantly mountainous Central Coastal Subregion occurs in alluvium-filled valleys and coastal plains and in deeper aquifers of Quaternary and Tertiary age. The intervening mountainous areas are underlain by consolidated sedimentary, igneous, and metamorphic rocks, mainly of Mesozoic age. These older rocks contain only small quantities of recoverable groundwater. Total storage capacity of 16 of the 24 basins is more than 20,000,000 acre-feet. The usable storage capacity of 18 of the basins is more than 7,600,000 acre-feet; the limiting factors are sea-water intrusion and high pumping lift. Groundwater temperature ranges from about 55 deg to about 75 deg F. The dissolved-solids content of the water is generally less than 800 parts per million, but locally is more than 11,000 parts per million. The predominate water type is calcium bicarbonate. Properly constructed wells in some areas can yield as much as 425 gallons per minute. (Woodard-USGS)
W71-09649

GROUNDWATER DATA AS OF 1967 - SOUTH COASTAL SUBREGION, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
J. S. Bader.
Geological Survey Open-file Report, March 5, 1969. 21 p, 1 fig, 97 ref.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Aquifer characteristics, *California, Reviews, Water levels, Water table, Water yield, Specific capacity, Withdrawal, Pumping, Water temperature, Groundwater recharge, Water quality, Chemical analysis, Dissolved solids, Aquifers, Hydrogeology, Water resources development.
Identifiers: *Groundwater resources.

Most usable groundwater in the predominantly mountainous South Coastal Subregion occurs in alluvium-filled valleys and coastal plains and in deeper aquifers of Quaternary and Tertiary age. The intervening mountainous areas are underlain by consolidated sedimentary, igneous, and metamorphic rocks, mainly of Mesozoic age. These older rocks contain only small quantities of recoverable groundwater. Total storage capacity of the 44 basins for which determinations have been made is nearly 100,000,000 acre-feet. The usable storage capacity is more than 800,000 acre-feet; the limiting factors are possible sea-water intrusion, thin alluvial material, and, locally, high pumping lift. Groundwater temperature ranges from about 55 deg to about 90 deg F, but locally is as high as 164 deg F. The dissolved-solids content of the water is generally less than 1,000 parts per million, but locally is more than 36,000 ppm. The predominant water type is calcium bicarbonate. Properly constructed wells in some areas can yield as much as 4,850 gallons per minute. (Woodard-USGS)
W71-09650

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR PIN OAK CREEK, TRINITY RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex.
B. B. Hampton, and D. R. Myers.
Geological Survey Data Report, 1970. 28 p, 2 fig, 4 tab.

Descriptors: *Surface waters, *Hydrologic data, *Data collections, *Texas, *Rainfall-runoff relationships, Floods, Storms, Flood control, Floodwalls, Stream gages, Discharge measurement, Flow rates, Water quality, Chemical analysis, Meteorological data, Hydrographs, Mass curves, Small watersheds.
Identifiers: *Pin Oak Creek (Tex), Trinity River basin (Tex).

This report contains rainfall and runoff data collected during the 1969 water year for the 17.6-square-mile area above the stream-gaging station Pin Oak Creek near Hubbard, Texas. The locations of floodwater-retarding structures and hydrologic instruments in the area are shown. The average rainfall during the 1969 water year was 28.42 inches, or 81 percent of the 12-year (1957-69) average of 35.30 inches. Rainfall was scattered throughout the year with every month receiving some rainfall. The monthly rainfall totals ranged from 0.09 inch in July to 5.46 inches in April. The mean daily discharge at the stream-gaging station Pin Oak Creek near Hubbard was 7.53 cfs, compared with the 13-year (1956-69) average of 11.8 cfs. The annual runoff was 5,450 acre-feet, or 5.81 inches which represents 20 percent of the total rainfall. Computations along with hydrograph and mass curves for storms are shown. Analyses are

given for two chemical-quality samples from Pin Oak Creek near Hubbard. The water contained calcium and bicarbonate as the predominant ions. (Woodard-USGS)
W71-09653

WATER RESOURCE OBSERVATORY WIND DATA - WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie.
Verne E. Smith.
Wyoming Water Resources Research Institute, Water Resources Series No 21, Sept 1970, 182 p. OWRR Project A-001-WYO (36).

Descriptors: Data processing, Computer programs, *Winds, Aneometers, *Data collections.
Identifiers: *Wind data.

Wind data that have been reduced from recording anemometer charts and from readings of totalizing anemometers are presented in tabular form. The card format and computer program to compute and tabulate the data are also presented.
W71-09745

A FAST FRACTIONAL GAUSSIAN NOISE GENERATOR,
IBM Watson Research Center, Yorktown Heights, N.Y.
Benoit B. Mandelbrot.
Water Resources Research, Vol 7, No 3, p 543-533, June 1971. 11 p, 1 fig, 4 tab, 14 ref.

Descriptors: *Statistical methods, *Markov processes, *Stochastic processes, *Statistical models, *Mathematical models, Synthetic hydrology, Simulation analysis, Probability, Statistics, Systems analysis.
Identifiers: *Gaussian noise.

By design fast fractional Gaussian noises (ffGn) have the following characteristics: The number of operations needed to generate them is relatively small. The long run statistical dependence that they exhibit is strong and has the form required for self similar hydrology. Their short run properties, as expressed by the correlations between successive or nearly successive yearly averages, are adjustable (within bounds) and can be fitted to the corresponding short run properties of records. Extension to the multidimensional (multisite) case should raise no essential difficulty. Finally, their definition, as sums of Markov-Gauss and other simple processes, fits the intuitive ideas that climate can be visualized as either unpredictably inhomogeneous or ruled by a hierarchy of variable regimes. (Knapp-USGS)
W71-09823

USE OF HARMONIC ANALYSIS TO STUDY TIDAL FLUCTUATIONS IN AQUIFERS NEAR THE SEA,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 02F.
W71-09824

ANALYSIS OF NONSTEADY FLOW WITH A FREE SURFACE USING THE FINITE ELEMENT METHOD,
Volcani Inst. of Agricultural Research, Bet Dagan (Israel); and California Univ., Berkeley. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-09826

WELL DATA GLOSSARY,
American Petroleum Inst., Dallas, Texas.
For primary bibliographic entry see Field 04B.
W71-09919

08. ENGINEERING WORKS

8A. Structures

CONTROL OF INFILTRATION AND INFLOW INTO SEWER SYSTEMS.
American Public Works Association, Chicago, Illinois.

Copy available from GPO Sup Doc as , $1.25; microfiche from NTIS as PB-200 827, $0.95. Environmental Protection Agency, Water Quality Office, Water Pollution Control Research Series 11022 Eff 12/70, December 1970. 121 p, 12 fig, 43 tab, 135 ref. Contract 14-12-550, Environmental Protection Agency, Water Quality Office.

Descriptors: *Infiltration, *Inflow, *Sewers, *Sanitary engineering, *Leakage, *Inspection, Drainage effects, Design criteria, Design standards, Design flow, Maintenance, Repairing, Joints (Connections), Cracks, Manholes, Surveys, Discharge (Water).
Identifiers: *Illegal connections, *Exfiltration, Roof drains, Foundation drains, Basement drains, Construction allowance.

Problems were studied of infiltration of ground and surface waters into sanitary sewers and inflows from various connections to these sewers. The 'infiltration' water is surface or groundwater that enters sewers through joints, cracks, breaks or indirectly through perforated or loose manhole covers or other faulty sewer structures. 'Inflow' water is piped into the sewer from basement and foundation drains, roof leaders, and other legal or illegal connections of storm sewers and combined sewers. Two hundred and twelve public jurisdictions in the United States and Canada were contacted, and twenty-six communities were visited. Practices of consulting engineers and state and provincial water pollution control agencies were also surveyed. The surveys indicated that infiltration and inflow are widespread problems. Reduction of infiltration should be stressed in both new and old systems. For new sewers a construction allowance of no more than 200 gallons per day per inch of diameter per mile of pipe is recommended. Existing systems must be extensively investigated to determine the extent and location of infiltration. Reduction of inflow waters can be accomplished after sources of such flows have been identified, alternate methods of disposal identified, and the backing of public and governing bodies secured. Twenty recommendations are given indicating the need for extensive investigation of the extent of the infiltration/inflow problem before relief sewers are constructed or waste water treatment plants built or enlarged. (Poertner)
W71-09591

OIL-WELL CEMENTING PRACTICES IN THE UNITED STATES.

Produced by the committees on Drilling and Production Practice, Division of Production, API. New York, American Petroleum Institute, 1959, 297 p 2356 refs.

Descriptors: *Cementing, *Oil industry, *Drilling, Drilling equipment, *Water wells.
Identifiers: History of cementing, API standardization, Physical properties of cement, Surface cementing equipment, Primary cement, Job testings, Squeeze cementing, Deep well cementing, Cementing in lost-return zones, Regulations.

Each year in the United States several thousand wells are drilled and completed - some productive of oil or gas and some dry - and during this drilling and completion most of these wells are cased, with the casing set in the bore hole surrounded by oil-well cement. This book has been written about the process of placing this cement and it covers how this and related operations are carried out. The compositions used in cementing are basically portland cements or cements prepared by supplementing portland with additives or by variations in grinding or other manufacturing processes. Compositions other than portland cement are sometimes used in wells and often applied using methods closely similar to those used with portland cement. However, this book should in no way be interpreted to mean that portland-cementing methods can invariably be used with other compositions. Some parts of the process of 'cementing a well' are closely similar wherever they might be carried on; while other parts may vary widely, dependent upon geographical location. Nomenclature or terminology particularly vary from one area to the next. This book attempts to fill this gap. It is very well illustrated and referenced. (Campbell-NWWA)
W71-09710

CASING DETECTOR AND SELF-POTENTIAL LOGGER,
Wisconsin State Univ., Superior.
M. H. Frimpter.
Groundwater, Vol 7, No 6, p 24-27, November-December 1969, 5 fig, 5 ref.

Descriptors: *Water wells, *Casing, *Logging (Recording), Water table, Aquifer characteristics, Groundwater.
Identifiers: *Casing length measurements (Wells), Galvanometer, Construction, Operation.

A simple and rapid method of determining casing length and permeable zones in wells tapping bedrock can be useful to sell drillers and hydrologists. A device consisting of a galvanometer, a reel of insulated wire, and a copper electrode locates the casing depth, changes of lithology, and permeable zones. The small-diameter electrode permits measurement through well-seal access ports avoiding the expensive and time-consuming procedure of removing the seal and drop pipes to measure casing depth with a magnet. The measured electromotive force changes rapidly when the electrode passes the end of casing. Thus, the depth of casing is easily determined from the length of wire payed out. Changes in electromotive force measured within the uncased part of a well frequently indicate permeable zones, thereby aiding in choice of the most efficient drop-pipe length, and also yielding useful information for hydrogeologic studies. (Campbell-NWWA)
W71-09724

DIRECT CONDUCTANCE METHOD OF MEASURING CASING LENGTHS,
Idaho Bureau of Mines and Geology, Moscow; and Adco Drilling and Research, Inc., Lewiston.
S. H. Ross, and G. Adcock.
Groundwater, Vol 7, No 4, p 26-27, July-August 1969.

Descriptors: *Water wells, *Casing, Water table, Groundwater.
Identifiers: *Casing length measurements (Wells), Water-level indicator.

The standard water-level indicator can be easily and inexpensively modified so that it also measures casing lengths. The simple modification permits electrical current from one wire of the two-wire probe to be routed through the metal casing. The semiquantitative method works well with most metal casings, including nonmagnetic ones, and can be used to detect most casing reductions. The method is limited in that it works only below the water level in the well, and in that it cannot easily detect casing reductions when the conductance between the upper and lower casings is low. (Campbell-NWWA)
W71-09725

CORROSION OF WELL POINTS AND PIPING IN DOMESTIC WATER NEAR AEC PLANT,
E. I. duPont DeNemours and Co., Aiken, S.C. Savannah River Lab.

E. C. Hoxie.
Groundwater, Vol 2, No 3, p 45-48, July 1964, 1 ref, 6 fig.

Descriptors: *Well points, *Corrosion, *Groundwater, Wells, Screens, Cathodic protection.
Identifiers: *Well point failure, Water analyses, Metallographic examination, AEC plant, Galvanized pipe, Water treatment, Alternative materials of construction.

Describes investigation made to determine cause of excessive corrosion of construction materials of wells supplying domestic water to communities bordering atomic energy plant in South Carolina. Corrosion resulted from natural corrosiveness of soft water with high carbon dioxide and oxygen contents. No effect from atomic energy plant was indicated. This problem was brought to the attention of the AEC by a well driller and local resident who believed that the corrosiveness of the water had increased since the start-up of operations at SRP approximately ten years ago. One of the puzzling features of the problem was that some wells gave good service for seven years or more while others failed in only a year and a half. Corrosion was concentrated below the water level. (Campbell-NWWA)
W71-09726

PREDICTING WELL YIELDS - TWO CASE HISTORIES,
Patchick Consulting Hydrogeologist, White Bear Lake, Minn.
For primary bibliographic entry see Field 03B.
W71-09733

PACKER TESTING IN WATER WELLS NEAR SARASOTA, FLORIDA,
U.S. Geological Survey, Sarasota, Fla. Water Resources Div.
H. Sutcliffe, Jr., and B. F. Joyner.
Groundwater, Vol 4, No 2, p 23-27, March 1966, 1 tab, 5 fig.

Descriptors: *Water wells, *Aquifer characteristics, *Artesian wells, Wells, Subsurface waters, Casing, Florida, Limestone, Water quality.
Identifiers: *Packer testing (Wells), Inflatable packer.

During February and March 1964, the U.S. Geological Survey ran caliper, conductance, and temperature logs on several wells in the Sarasota area. The Florida Geological Survey had previously run gamma ray and electric logs on the same wells. Two flowing wells were selected for packer testing. The two wells are about the same depth, penetrate essentially the same geologic horizons, and are about 16 miles apart. The packers were set in the wells between the producing horizons of the formations penetrated and each of the horizons was tested for head, amount of production, and quality of water. One of the tests produced excellent results, indicating that the various producing zones were effectively isolated by the packers and that different quality of water, quantity of water, and a different head was available from each zone. The other test did not show sharp differences but did indicate the extent of contamination of the producing horizons in a flowing well which had been capped for approximately two years. These tests indicate that packer testing can measurably add to knowledge of the separation of permeable zones. (Campbell-NWWA)
W71-09734

A DOSING SIPHON FOR DISCHARGING CLEANING WATER INTO FLUSHING GUTTERS,
Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W71-09747

ECONOMIC APPLICATION OF INSERT BITS,
Dresser Industries, Inc. Dallas, Tex.
G. C. Jackson.
30th Annual Meeting American Association of Oilwell Drilling Contractors, September 22-25, 1970, 12 p, 6 fig.

Descriptors: *Drilling, *Rotary drilling, *Drilling equipment, Oil industry, Wells.
Identifiers: Sealed bearing insert bits, Field performance, Limits of performance, Drillability.

Sealed bearing insert bits have proven to be economical in a wide variety of applications previously drilled by sealed and nonsealed milled tooth bits. Economic performance of the relatively new 'medium' and 'soft' types has been obtained mostly on the basis of extrapolation of past experience with 'harder' type bits. The full economic potential of these 'softer' types may have not been achieved. A practical approach to evaluating the possible economy of a sealed bearing insert bit is to examine past performance of milled tooth bits, the logs and the mud programs which produced that performance. A cost analysis of the bit record and a study of the bit record in conjuction with the log and recorded dull condition have proven to be a good approach. Long intervals of similar drillability and cost per foot usually lend themselves to the economical application of a sealed bearing insert bit. Drilling problems, such as deviation, undergage sections and lost circulation, are added cost incentives. (Campbell-NWWA)
W71-09904

WELL POINTS FOR DEWATERING,
D. G. Noble.
Ground Water, Vol. 1, No. 3, p. 21-26, July 1963, 9 fig.

Descriptors: *Dewatering, *Drainage engineering, *Wells, Ground water, Wellpoints.
Identifiers: *'Running' sand, Australia, Construction excavations, Dewatering method, Well point equipment.

Techniques in use of well-point equipment for dewatering operation in Australia are described. Construction features of equipment used successfully in drying-out trenches for pipelaying, excavation for underground structures, and dewatering base area for low-level pumping stations are discussed. Typical layouts of well-point equipment and typical pumping equipment features are given. Case histories of recent use of well-point equipment are presented. (Campbell-NWWA)
W71-09905

CYCLIC PUMPING FOR DRAINAGE PURPOSES,
California Univ., Davis.
For primary bibliographic entry see Field 04B.
W71-09907

THE GROUND WATER CONSULTANT LOOKS TO THE DRILLER,
Guyton (William F) and Associates, Austin, Tex.
M. L. Klug.
Ground Water, Vol. 4, No. 4, p. 20-22, October 1966.

Descriptors: *Drilling, *Water wells, Logging (Recording), drilling equipment.
Identifiers: *Ground water consultant, *Well contractor, Geologic information, Well construction, Sieve analysis, Well performance, Sand control.

The consultant expects the driller to provide good data and competent performance. Exchange of views associated with drilling and construction can prove to be mutally beneficial. Contacts between the consultants and the drillers have a tendency to upgrade the quality of the basic data collected. These contacts may aid the driller in delivering full performance and thus improve the overall quality of the drilling and construction he performs for the client. As a result, everybody associated with the water well industry - drillers, consultants, and clients - stands to gain by these contacts. It is hoped that these beneficial contacts within the water well industry will become even more common in years to come so we all can gain from one another's knowledge and experience. (Campbell-NWWA)
W71-09908

SUCCESSFUL ACIDIZING,
Dowell, Inc., St. Louis, Mo.
I. R. Bielek.
Water Well Journal, Vol. 10, No. 8, p. 9, 24-26, 29, 7 tab., 4 ref., August 1956.

Descriptors: *Acidizing, *Water wells, *Stimulation (wells), Aquifer characteristics, Screens, Specific capacity.
Identifiers: Carbonate deposits, Iron deposits, Micro-organisms, Backwashes.

As a result of the survey the effectiveness of the new acidizing techniques, incorporating backwashing and surging, has been established. These techniques have proved effective for use in preventing rapid fall of water levels and steep decline curves resulting from blocking of screens and flow channels by formation particles. For maximum success in an acidizing treatment, all pertinent data should be studied and evaluated. The well history, water analysis, subsurface logs, and past experience are valuable guides in adapting proven techniques to the individual well. Even if the treatment fails to produce the desired production boost sufficient information may be obtained to formulate a successful workover program or prove the well economically dead. (Campbell-NWWA)
W71-09909

ROTARY DRILLING MUDS,
Nebraska Univ., Lincoln. Conservation and Survey Div.
V. H. Dreeszen.
Water Well Journal, Vol. 13, No. 7, p. 18-20, September 1959, 4 fig., 10 ref.

Descriptors: *Water wells, *Rotary drilling, *Drilling fluids, Wells, Muds.
Identifiers: Cuttings, Mud pit, Well pressure, Filter cake, Caving, Lubrication.

The protection and development of water from permeable formations can be a problem with any type of well drilling method. The methods for protecting water-bearing formations when the rotary method of drilling is used are discussed. The methods are: remove all the cuttings from the hole, do not recirculate cuttings (keep the drilling mud clean), and use a low filter-loss mud to build a thin filter cake opposite permeable formations and to prevent sloughing of silt and clay formations. The drilling mud must be removed from the drilled hole and from the hole walls in order to develop a producing well satisfactorily. The paper is well referenced. (Campbell-NWWA)
W71-09910

APPLICATION AND LIMITATION OF METHODS USED TO ANALYZE PUMPING TEST DATA,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W71-09911

SOME PRINCIPLES AND DEVELOPMENTS IN HARD ROCK DRILLING TECHNIQUES,
C. Fairhurst, and W. D. Lacabanne.
6th Annual Drilling and Blasing Symposium , University of Minnesota, October 11-13, 1956. Minneapolis, p. 15-25, 2 tab., 10 fig., 10ref.

Descriptors: *Drilling, Rotary drilling, *Water wells, Rock mechanics, Drilling equipment.
Identifiers: *Percussive drilling, *Hard rock drilling, Mechanics of rock fragmentation, Wedge angle, Penetration rates, Fracture mechanism, Europe.

This paper describes the general mechanism of rock breakdown in the two most used drilling methods, namely percussion and drag type rotary. Most other systems can to a large extent be classified within these types. (Table 1) Consideration of the mechanics reveals the inherent limitations of each and indicates the reasons why the comparatively recent method of rotary-percussive drilling offers hope for improved drilling performance, especially in the harder rocks. Results obtained in practice in Europe are shown to support this view. Analysis of the basic mechanics of rotary and percussive methods of drilling indicates that each has definite limitations in application, but that it is possible to combine successfully the systems to overcome most of thsese limitations. Rotary-percussive drilling appears to offer considerable promise for much higher penetration rates in rocks previously too hard to drill by anthing other than diamond or straight percussive drilling methods. (Campbell-NWWA)
W71-09912

MODERN DESIGN TECHNIQUES FOR EFFICIENT HIGH CAPACITY IRRIGATION WELLS,
Universal Oil Products, St. Paul, Minn. Johnson Div.
J. W. Reinke, and D. L. Kill.
1970 Winter Meeting, American Society of Agricultural Engineers, Chicago, Illinois, December 8-10, 1970, Paper No. 70-732, 23 p., 2 tabs., 5 fig., 4 ref.

Descriptors: *Irrigation wells, *Ground water, *Water wells, Screens, Casing, Drilling, Drilling equipment.
Identifiers: *Gravel packed well, *Well efficiency, *Well development, Sand pumping, Well life, Design criteria.

Common irrigation well design problem areas are reviewed. Modern design criteria that are presented insure sand-free water, overall high efficiency and long well life. The benefits of suggested procedures are economical, low-cost irrigation wells. The initial cost of the suggested procedures and quality materials is greater than traditional completion methods but is the best investment the irrigation farmer can make. The construction, operation and maintenance costs of an efficient, sand-free irrigation well amortized over a 25-year period will be the cheapest well possible. The long-term economics of modern irrigation well design is in the interest of adding much needed profits to agriculture. (Campbell-NWWA)
W71-09913

DEEP-HOLE DRILLING WITH EXPLOSIVES,
A. P. Ostrovskii.
Russian text was pbulished by Gostoptekhizdat, State Scientific and Technical Publishing House of the Petroleum and Mineral Fuel Industry, Moscow, 1960. New York, Consultants Bureau, 1962, 133 p., 67 refs., 77 fig., 39 tabs.

Descriptors: *Oil industry, *Drilling, Rock mechanics, Drilling equipment.
Identifiers: *Novel drilling techniques, *Explosive drilling, Penetration rate, Method technology and technique.

The development of an effective method of drilling wells to depths of 3-5 km and more is a complex problem of great practical interest. 'Deep Hole Drilling With Explosives' is a distincitve and very interesting work of the engineer A. P Ostrovskii, who more than twenty years ago, by his original suggestions, made a start in investigating the field of so-called non-bit processes of shattering rocks when drilling holes, and with his co-workers, developed a fundamentally new explosive method of drilling deep holes. This book discusses the new trend in worldwide application of explosives in technology and the national economy; it presents considerable experimental material on the effect of explosions in solid media, material that is not only interesting to specialists in mining but also to physicists. Many phenomena discussed by the author and cited in the book still await explation, but the fact that these phenomena have been already subjected to experimental study undoubtedly adds to our knowledge of one of the most meagerly investigated areas of the science of explosions-concerning the shattering effect of explosions on solid media. (Campbell-NWWA)
W71-09914

WHY STRONG ACID PAYS OFF IN CARBONATE RESERVOIRS,
Dow Chemical Co. Tulsa, Okla. Dornell Div.
O. E. Harris, C. W. Crowe, and R. W. Dennis.
World Oil, Vol. 163, No. 7, p. 76-80, December, 1966, 6 fig., 1 tab., 6 ref.

Descriptors: *Aquifer characteristics, Porosity, Specific yield, *Stimulation, Limestone.
Identifiers: *Fracture acidizing, *Carbonate aquifers, Well completion, Reaction rates, Calcium chloride, Fracture penetration, Inhibition.

Hydrochloric acid in concentrations greater than the 15 percent normally used will significantly improve fracture acidizing results from carbonate reservoirs. Acid properties at concentrations above 15 percent change with increasing concentration. By understanding these changes and how and why they occur, high-strength acid can be advantageously used to provide: (1) Greater formation conductivity resulting in sustained production and injection increases. This is particularly true in reservoirs of high water saturation which make weaker solutions of acid ineffective because of rapid dilution. (2) Greater penetration, because of more rapid initial decrease in area-to-volume ratio. (3) Greater volume of CO2 gas per barrel of reacted acid. This has proved extremely effective in aiding well clean-up. (4) Greater penetration due to retardation produced by concentration increases of the acid itself and of the reaction products in solution in the partially spent acid. (Campbell-NWWA)
W71-09916

APPLICATIONS OF ACETIC ACID TO WELL COMPLETION, STIMULATION AND RECONDITIONING,
Halliburton Co., Duncan, Okla.
F. N. Harris.
Journal Petroleum Technology, Vol. 13, No. 7, p. 637-639, July 1961, 1 tab., 2 fig.

Descriptors: *Acidizing, *Water wells, Oil industry, Ground water.
Identifiers: *Well completion and stimulation, Acetic acid, Hydrochloric acid, Perforating fluids, Carbonate scale removal, Surfactant carrier, Transitory emulsion.

Acetic acid has been used successfully many times in the past few months, in various treating mixtures and in a number of different applications. It has been used as (1) a perforating fluid, (2) a retarded acid without viscosity, (3) a treatment for removal of carbonate scale in the prescence of aluminum metal at elevated temperatures, (5) a 'kill' fluid for wells, (6) a weak aqueous solution for carrying surfactants to remove emulsions and water blocks in the prescence of water-sensitive clays, (7) a first-stage treating fluid ahead of hydrochloric acid for a greater drainage pattern and (8) a transitory true gel or emulsion for placement of temporary bridging agents. (Campbell-NWWA)
W71-09917

ROTARY DRILLING HANDBOOK,
J. E. Brantly.
New York, Palmer, 1961, 6th Ed., 825 p.

Descriptors: *Drilling, *Rotary drilling, *Wells, *Oil industry, Pumps, Drilling fluids, Mud, Cements, Casing, Pipe.
Identifiers: Bits, Air and gas drilling, Bit weight, Rotating speed, Straight-hole drilling, Fishing, Formation testing, Safety measures.

This book is one of the few comprehensive classics on rotary drilling produced by the oil industry. This 6th edition has been up-dated to include most of the common techniques in use today. It contains thirty-one chapters and covers the entire spectrum of oil well drilling methods, from the basic principles through pipe and depth measurements, cementing, and safety control. This book can be used as a single source for information on the practical aspects of rotary drilling presently used. Its value to the ground water industry is not found in the many petroleum and natural gas oriented techniques discussed but rather in the philosophy of development over the past years. Some of the techniques are, however, clearly applicable to shallow drilling with only minor modifications or extrapolations, especially the chapters on bits and cementing as well as the glossary, which contains a multitude of semi-pertinent tables, formulas, and graphs. (Campbell-NWWA)
W71-09920

PRINCIPLES OF DRILLING FLUID CONTROL,
American Petroleum Inst., Dallas, Tex.

Edited by Subcommittee of the API Southern District Study Committee on Drilling Fluids. Dallas, American Association of Oilwell Drilling Contractors, 1969, 215 p.

Descriptors: *Drilling fluids, *Drilling, *Rotary drilling, Wells, Drilling equipment, Oil industry.
Identifiers: Drilling fluid composition, Circulating systems, Mud systems, Lost circulation.

The fluid used in rotary drilling, once reagarded only as a means of bringing rock cuttings to the surface, is now recognized as one of the major factors involved in the success or failure of the drilling operation. In addition to lifting the cuttings, the drilling fluid must perform other, equally important functions directed toward the efficient, economical, and safe completion of the drilling operation. For this reason, the composition of the drilling fluid and its resulting properties have become the subject of much study and analysis. As attempts are made to drill deeper and consequently more hazardous wells, and to more fully exploit productive formations, the drilling fluid is expected to have physical and chemical properties that enable it to contend functions has required that the composition of the fluid become more varied and its properties more subject to control, with the result that the cost of maintaining an effective drilling fluid has become a major drilling expense in many areas. This manual discusses the well conditions which occasion the need for control of drilling fluid properties, and the most economical means of gaining and maintaining this control. The term 'drilling fluid' includes air, gas, water, and mud. The term 'mud' refers to a suspension of solids in water or oil, or of solids and droplets of one of these liquids dispersed in the other. This training manual discusses each of these drilling fluids, including the modification of muds for use as packer fluids, but deals primarily with those fluids used most often in the field, namely, suspensions of solids in a liquid, 'muds', and suspension of solids and droplets of a liquid in a second liquid, 'emulsion muds.' (Campbell-NWWA)
W71-09921

JET BIT MECHANICS,
Texas Univ., Austin. Petroleum Extension Service.

Petrol 1970, January, 100 p., 19 ref.

Descriptors: *Drilling, *Rotary drilling, *Drilling equipment, Casing, Pipe, Oil industry.
Identifiers: Bits, Horsepower, Rotational energy, Rock fracture, Rock-chip removal, Rock-bit design, Back pressure, Rotary speed.

Probably the most important single realization in rotary drilling is that rock must not only be fractured on bottom, but also must be removed from the rock face instantly and efficiently, to provide for further fracturing and drilling progress. For this

purpose, two types of energy sources are brought from the surface to the rock face and applied as efficiently as possible. These are: (a) Mechancial energy, applied through rotary and drill string, and converted into its most useful form through the mechanism embodied in the bit cones and teeth and (b) hydraulic energy, applied through pump and drill string conduit, and converted into its most useful form through correctly positioned jet nozzles, aimed at the rock face just ahead of the oncoming tooth. Mechanical energy is some times thought of as the medium for rock fracture, and hydraulic energy as the medium for chip removal and bottom scavenging. In fact, however, both types of energy play a part in both rock fracture and rock removal, as we shall see more clearly later in these discussions. Furthermore, although no progress can be achieved without rock fracture, it is undoubtedly the least problematic feature of rotary drilling, and our studies will in consequence be largely concerned with the more complex mechanism of rock cutting removal. Moreover, as the provision of hydraulic energy in its most useful form has already been covered in an earlier manual in this series entitled 'Jet Bit Hydraulics,' our hydraulic analysis here will be concerned principally with the manner in which the hydraulic energy assists and complements mechanical energy at the rock face. (Campbell-NWWA)
W71-09922

JET BIT HYDRAULICS,
Texas Univ., Austin. Petroleum Extension Service.

Austin, University of Texas, Petroleum Extension Service, 1969, 141 p., 65 fig.

Descriptors: *Drilling, *Rotary drilling, *Drilling fluids, *Pumps, Casing, Pipe, Oil industry, Drilling equipment.
Identifiers: Bits, Bit hydraulics, Pressure energy, Energy losses, Static and dynamic pressures, Drill pipe, Pressure drop at bit, Pump pressure.

Drilling nowadays is carries out at high bit loads, often combined with fast rate of rotation to achieve rapid drilling rates especially in softer rock. No such high penetration rates are possible, however, without the aid of a powerful jet stream at the drilling face, assisting the mechanical forces in the process of rock breakage and ensuring that the broken rock particles are swept free of the oncoming rockbit teeth to prevent unnecessary regrinding. The success of our drilling operation demands an adequate supply of hydraulic energy at the bit to perform this function. The cost of supplying such energy will depend, not only on the size of the pump, but on how much of its outgoing energy actually reaches the rock face and performs useful work. It is, then, clearly in the interest of those wishing to reduce footage drilling cost to maintain the hydraulic system on their rigs at a high overall hydraulic efficiency. This manual sets forth in basic terms what must be done to achieve this, and explains why such recommendations are successful. The leading requirement of a hydraulic system for a drilling rig is to provide adequate hydraulic power at the rock face, where the mechanical forces are at work fracturing and removing the rock. The second requirement of a hydraulic system for a drilling rig is to provide fracturing and removing the rock. The second requirement of the system is to provide a means of returning cuttings to the surface, for identification, in such a way as to maintain clean, stable hole condition for drilling and for the passage of bit and drill stem during round-trips. (Campbell-NWWA)
W71-09923

ROTARY DRILLING: THE BIT.

Lesson in Rotary Drilling, Unit I, Lesson 2: The Bit, 1966, 48 p., 46 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry.
Identifiers: *Roller cone bits, *Rock bit selection, Special purpose rock bits, Bit economics, Diamond drilling bits, Drag bits, Specialty bits.

The bit and the way it performs is what drilling is all about. And the bit only performs when it is on bottom. Furthermore, when it is on bottom it makes hole - and money - only when it is effective in that formation. Even then it must be in at least fair condition. There must be weight on it, which is a function of the frill collars. And it must get a hand from the drilling fluid. Finally it must be rotated. Rotation is accomplished by the rotary. Even so, there are tools called turbo-drills where rotation is accomplished by the flow of drilling fluid through a bottom-hole turbine in the drill string. The drill pipe is stationary during the drilling. These are rare exceptions at the time of this writing in 1966. Main consideration in this series will be limited to those bits which are turned by the rotary table. There are many variables in the performance of bits with respect to any given formation. These all resolve into questions of economics, that is, into the selection of the one that seems most likely to make the greatest contribution to the progress of drilling. (Campbell-NWWA)
W71-09924

ROTARY DRILLING: THE DRILL STRING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling Unit I, Lesson 3: The Drill String, 1965, 58 p., 15 tab., 61 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry, Pipe.
Identifiers: *Drill string, *Drill pipe, Tool joints, Drill collars, Collar inspection, A.P.I. standards.

The drill string (sometimes called the drilling string) consists of the drill pipe, the tool joints, and the drill collars, together with certain accessories which are commonly used while drilling, although not always required in every situation. These accessories include stabilizers, reamers, and subs (short for 'substitutes'). Although no string of drill pipe is complete without tool joints, the two items are treated separately in order to more clearly describe each and in order to simplify discussion of maintenance of each. In the oil world today an overwhelming majority of all drill pipe is made to standards approved by the American Petroleum Institute. These standards cover the physical properties of the steel from which the pipe is made, the method of manufacture, and the physical dimensions of the pipe. These dimensions cover thread forms, wall thickness, inside and outside diameters, and length of joints of pipe. Also standardized is the weight of the pipe. By agreement between the buyer and the manufacturer, drill pipe can be bought which does not conform to these standards. The important thing is that when the purchase is made on the basis of API standards, the buyer is sure of what he is buying. (Campbell-NWWA)
W71-09925

ROTARY DRILLING: SAFETY ON THE RIG.

Issued by Petroleum Extension Service, University of Texas, Austin. Lesson in Rotary Drilling, Unit I, Lesson 10: Safety on the Rig, 1967, 51 p., 16 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry.
Identifiers: *Drilling safety, First aid, Safety equipment, Safety practices.

Following safety rules and practices is a must in the drilling business. The importance of protective measures on and around drilling rigs cannot be over-emphasized. Safety, of course, is important in everyday living. It is something we are conscious of, no matter what we do, throughout life. It is important in the home, at work or play, on streets and highways, wherever we go. Safety is emphasized much more than usual around a drilling rig because drilling is a hazardous business. It is a rewarding business for those who like it and grow with it safely, day by day. Drilling personnel must know how to work safely on a rig in order to protect themselves and the expensive equipment they operate. Several hundred thousand dollars are usually invested in a drilling rig which is depended on to 'make hole' efficiently and safely in order to make money. Drilling is a highly competitive business, with constant effort to save valuable time which represents considerable expense to the drilling contractor and to his customer, the operator. Drilling crews must be as fast and efficient as possible but speed and efficiency also require safe operating practices, since accidents and lack of safety precautions can be extremely costly - not only in injuries and damaged or lost equipment but in loss of life. (Campbell-NWWA)
W71-09926

ROTARY DRILLING: MAKING HOLE.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 1: Making Hole, 1968, 55 p., 28 fig.

Descriptors: *Drilling, *Rotary drilling, *Oil industry, Drilling equipment, Drilling fluids.
Identifiers: *Bits, *Drilling time tests, Rotary factor, Hydraulic factor, Differential pressure, Drilling practices, Lost circulation, Tripping.

It is not often that everything can be ideal in drilling. Decisions on the proper course in making hole involve many compromises. A certain section to be drilled is for the most part easy digging - soft shales for example. So a long-tooth bit is run in. In the soft digging there turns up one thin section of hard rock. You dull the bit and pull it before you break out of the hard streak. You decide to run in a hard-formation bit. You drill a few feet and break out into the soft, sticky shale again. Your hard-formation bit just will not cut it. So you pull it. Now, what to do. Could be that you compromise on a bit that will make hole in the soft stuff - though not as fast as you might like. But it will also stay with you longer if you hit another hard stringer. This is a compromise bit that is less than ideal in either the soft digging or the hard. The business of making hole is often a long series of such compromises. To make the right decision the driller and pusher have to be aware of the factors involved in drilling. The most significant of these will be mentioned here and discussed further along. (1) the geological section, (2) the capability of the rig, (3) the drilling fluid program, (4) the bit, (5) three critical factors: weight on the bit, rotary operation, the hydraulic factor. (Campbell-NWWA)
W71-09927

ROTARY DRILLING: DRILLING MUD.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 2: Drilling Mud, 1968, 98 p., 24 tab., 18 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Drilling fluids, Wells, Oil industry.
Identifiers: *Drilling mud composition and properties, Conditioning drilling muds, Common drilling problems, Mud treating chemicals and additives.

The drilling fluid, originally regarded only as a vehicle for transporting cuttings to the surface in rotary drilling, is now recognized as one of the major factors involved in the success of the drilling operation. Speed, efficiency, safety, and cost of drilling depend upon the performance of the drilling fluid used. The term 'drilling fluid' properly includes gases, as well as liquids and suspensions of liquids and solids in liquids. This lesson is limited to a discussion of suspensions of solids in a liquid, 'muds', and of solids and a liquid in a second liquid, 'emulsion muds'. As attempts have been made to drill deeper and more hazardous wells and to improve exploitation of productive formations, the

drilling mud has been expected to perform more functions. To perform these functions satisfactorily, the composition of the mud has become more varied and the properties have become more subject to control. The cost of maintaining effective drilling mud is now necessarily a major item of the over-all expense of drilling in many areas. The purpose of this lesson is to discuss the need for, the methods employed in, and the most economical maintenance of effective mud control. (Campbell-NWWA)
W71-09928

ROTARY DRILLING: CASING AND CEMENTING.
For primary bibliographic entry see Field 08F.
W71-09929

ROTARY DRILLING: TESTING AND COMPLETING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 5: Testing and Completing, 1968, 64 p., 69 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry, Aquifers, Wells, Stimulation.
Identifiers: *Well completion, Formation evaluation methods, Nitro shooting, Acidizing, Hydraulic fracturing.

The economic purpose for drilling oil wells is to produce oil or gas. From the very earliest days it was recognized that testing the porous zones to obtain samples of the fluid contents in a well was an essential part of the drilling job. The cable tool method of drilling in fact made possible a continuous test prior to completing a well. Tests of fluid volume and pressure were accomplished while drilling continued; when the well had tested satisfactorily, or when as much fluid as possible had been obtained drilling was stopped. Sometimes the flow of oil or gas reached such a high rate while 'drillin in' a well that the need arose for a packing gland arrangement around the drilling cable. When the flow of the well began to hold up the tools to such an extent that they would go slack, the tools were pulled and the well was produced until the flow decreased so that deepening could be continued. The inability to sample formation fluids and to test production as drilling proceeded delayed acceptance of the rotary method for a long time. It was recognized that the rotary could make fast hole, but it was also evident that, when using this method, hole might be drilled through productive zones without noticing the evidence of oil or gas. The introduction of coring tools in 1921, drill stem testing (DST) in 1926, and electric logging in 1933, changed the picture completely for rotary drilling. These innovations, and others that followed, made it possible to obtain detailed information of oil and gas shows when they were encountered. Conventional coring was followed by wire line coring; both were almost completely supplanted by electric logging techniques. Drill stem testing and electric log analysis have progressed to the point that formation evaluation can be accomplished without setting casing. (Campbell-NWWA)
W71-09930

ROTARY DRILLING: FISHING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit III, Lesson 2: Fishing 1968, 31 p., 49 fig.

Descriptors: *Drilling, *Rotary drilling, Drilling equipment, Oil industry.
Identifiers: *Fishing (Drilling), Drill pipe recovery, Drill collar recovery, Wire rope and cable recovery.

The term 'fishing' stems from the early cable-tool practice of dangling a homemade hook or spear in the hole in an attempt to snag a broken drilling line and thereby retrieve the tool attached. On modern drilling rigs, fishing has become the art and science of removing broken or stuck equipment, or small, non-drillable materials from the well bore. The fish may be anything from a part (or all) of the drill string, to smaller pieces of equipment such as bit cones, pieces of tools or any material accidentally dropped into the well bore. Even small pieces of iron pyrite, which occurs naturally in some formations, may work loose and impede drilling to the extent that they must be fished from the hole. There are many types and kinds of fishing tools. Which tools are used depends on the type of fish in the hole, whether the fish is stuck or free, whether it is in a cased or open hole, the condition of the hole at the site of the break, and the condition of the top of the fish. Each fishing job is unique, but there are some basic techniques and tools used in all of them and these will be discussed in this lesson. Furthermore, the lesson will be restricted to fishing in open hole. The term 'open hole' pertains to that part of the hole which does not contain casing. Cased-hole fishing is usually associated with production problems that occur after the drilling rig has moved away; however, some of the techniques used in open-hole fishing are also used in cased-hole fishing. (Campbell-NWWA)
W71-09931

8B. Hydraulics

THE FLOW OF WATER OVER AND WITHIN A PROTECTIVE LAYER OF COARSE, GRANULAR MATERIAL,
Mississippi State Univ., State College. Dept. of Agricultural and Biological Engineering.
J. C. McWhorter, and Melville S. Priest.
Available from the National Technical Information Service as PB-200 825, $3.00 in paper copy, $0.95 in microfiche. Completion Report, Water Resources Research Institute, May, 1971, 19 p, 12 fig. OWRR PROJECT A-046-MISS (1).

Descriptors: Channels, *Oxygen channel flow, *Sedimentation, *Boundries (Surfaces), Hydraulics, *Roughness (Hydraulic), Linings, *Gravels.

The effectiveness of a layer of gravel in shifting the zone of relatively high velocity gradient and correspondingly high shear stress away from a channel bottom is shown by means of graphs. For purposes of generalization, pertinent quantities are arranged in appropriate dimensionless parameters through which the effects of bed slope, relative thickness of gravel layer, and relative size of gravel on a dimensionless velocity profile are presented. It is through comparison of dimensionless velocity profiles that effects and effectiveness become apparent.
W71-09558

COMPARISON TESTS OF PLAIN AND RIFLED DREDGE DISCHARGE PIPE.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. B. Pittard, James E. Glover, and Arthur G. Davis.
Available from the National Technical Information Service as AD-722 215, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-751, Jan 1967. 50 p.

Descriptors: *Inland waterways, *Pipes, *Test procedures, *Dredging maintenance, Sedumentation, Arkansas, Tennessee, Mississippi River.
Identifiers: Hydraulic systems, Maintenance equipment, Vacuum pumps, Rifling, Dredges.

Tests were undertaken in the Memphis District to compare rifled dredge pipe with plain dredge pipe. Test results indicate that the output of the rifled pipe did not differ significantly from that of the plain pipe for lengths of 800 ft. Pipeline velocity was found to be closely related to dredge production. The rifled pipeline was equally as productive as the plain pipeline at about 18.5 fps and progressively more productive as the system was loaded to a maximum productivity at about 15 fps. However, the use of rifled pipe with present dredging methods and pipeline lengths is not justified and would be less economical than the use of plain pipe in view of greater cost of rifled pipe and increased fuel consumption. The instrumentation developed for the tests afforded better control of the dredging operation and thereby provided personnel a more positive means of improving production under varying conditions.
W71-09565

WILLOW SPRINGS AND SAG JUNCTION DIVERSIONS, CHICAGO SANITARY AND SHIP CANAL, ILLINOIS, HYDRAULIC MODEL INVESTIGATION.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Thomas E. Murphy.
Available from the National Technical Information Service as AD-722 230, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-776, May 1967. 39 p.

Descriptors: *Inland waterways, *Model studies, *Flow, *Channel improvement navigation, Illinois, Flood control.
Identifiers: *Hydraulic models, Hydraulic systems, Chicago Sanitary and Ship Canal, Des Plaines River.

The Turtle Creek channel improvement plan is proposed for the lower end of Turtle Creek near Pittsburgh, Pennsylvania, to provide flood protection for a 20,000-cfs design discharge from the mouth to a point 3.8 miles upstream. The model investigation was concerned with the study of the hydraulic performance of the proposed design in the lower reach, the effect of low level bridges, abutments, and other channel constrictions, and the evaluation of various modifications to the proposed design. An undistorted model, scale 1:50, reproducing the lower 7800 ft of Turtle Creek and a portion of the Monongahela River at the confluence was used for the investigation. Tests indicated that the proposed channel would be generally adequate to carry the design discharge, provided the lower reach is maintained reasonably free of deposition. Additional reduction in stages could be obtained by realignment of the lower 800 ft of channel to eliminate projecting piers and abutments and by removing projections and obstructions remaining in the channel upstream.
W71-09567

TURTLE CREEK, PENNSYLVANIA, CHANNEL IMPROVEMENT. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
James E. Glover, and John J. Franco.
Available from the National Technical Information Service as AD-722 212, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-765, March 1967. 66 p.

Descriptors: *Inland waterways, *Model studies, *Flow, Sedimentation, Flood control.
Identifiers: *Hydraulic models, Pennsylvania, Turtle Creek.

Proposed diversion channels from the Chicago Sanitary and Ship Canal into the adjacent Des Plaines River at Willow Springs Road and Sag Junction, Illinois, were investigated in 1:60-scale models. Also, a 1:16-scale section model was used to study performance of the gated structures planned for regulation of flow through the diversion channels. Both diversion channels will have their bottoms in rock with concrete retaining walls above ledge rock. A roadway bridge will cross the entrance of each diversion channel, and flow through the channels will be regulated by control structures comprised of 16-ft-wide vertical-lift gates—10 gates at Willow Springs and 7 gates at Sag Junction. Impact-type stilling basins will be pro-

vided to disipate the flow through the gates. The gate structures and stilling basins performed as anticipated. Due to the flat angle at which the Willow Springs Diversion intersected the canal, flow into the diversion was concentrated near the downstream side of the entrance, creating cross-currents in the canal which were considered hazardous to navigation. Equal distribution of flow along the channel entrance and satisfactory navigation conditions in the canal were obtained by installing curtain walls, extending from above the water surface to selected elevations, along the upstream noses of the bridge piers. Navigation conditions at the Sag Junction Diversion were satisfactory. Capacity of each of the diversions was greater than the stated requirement. Calibration data, obtained in the models, should be useful in setting up normal and emergency operating schedules.
W71-09568

ARKANSAS RIVER NAVIGATION ENTRANCE. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco, Louis J. Shows, and James E. Foster.
Available from the National Technical Information Service as AD-722 213, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-795, Sep 1967. 50 p.

Descriptors: *Inland waterways, *Model studies, *Flow, *Navigation dams, Arkansas, Missippi River, Flood control.
Identifiers: *Hydraulic models, River currents, Flow fields, Arkansas River, White River, Flood control.

This study was concerned with the lower portion of the Arkansas River project which enters the Mississippi River through Arkansas Post Canal and White River. Tests were conducted on a fixed-bed model with a horizontal scale of 1:600 and a vertical scale of 1:100 reproducing the Mississippi River from mile 571 AHP to mile 604 AHP, Arkansas River from its mouth to a point about 56.5 miles upstream, White River from its mouth to a point 12 miles upstream, and adjacent overbank and backwater areas. Investigation was conducted to determine effects of various cutoffs on navigation, determine most favorable location for entrance into the navigation canal from Arkansas River, study the flow pattern and velocities in the entrance to the canal, and determine adequacy of proposed flood-control plan. Results of investigation indicated: Arkansas-White Cutoff would continue to develop unless preventive measures were taken. Closing Arkansas-White Cutoff with a fill near White River would essentially eliminate channel flow from the Arkansas to White River which would both improve navigation conditions and reduce the maintenance required in the navigation channel of the lower White River. Closure of cutoff would have little or no effect on stages during major floods. Development of Sawmill Bend Cutoff would increase the tendency for Arkansas-White Cutoff to develop. Development of Avenue Landing Cutoff would tend to reduce stages upstream and flow from Arkansas River toward White River through the Arkansas-White River Cutoff. No serious navigation difficulties were indicated near the mouth of White River under the conditions tested. The Project Plan would provide the best entrance conditions to the navigation canal. The dam should be placed farther downstream than originally planned and training dikes would be required at the head of the bend to improve navigation conditions and reduce the tendency for shoaling.
W71-09569

MODEL STUDY OF HOPPER DREDGE DRAGHEADS. HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
John J. Franco.
Available from the National Technical Information Service as AD-722 214, $3.00 in paper copy, $0.95 in microfiche. WES Technical report 2-755, Jan 67. 87 p.

Descriptors: *Inland waterways, Sedimentation, *Dredges, *Model studies, Dredging.
Identifiers: *Maintenance equipment, *Hopper dredges, *Dragheads, Vacuum pumps.

This investigation was conducted to determine the factors affecting the performance of dragheads and to develop parameters for use in the design and operation of dragheads when dredging in sand. The study was conducted in a 60- by 10-ft flume with a 1:6-scale model of the draghead and suction line. The suction line was attached to a centrifugal pump mounted on a carriage which could be made to travel the length of the flume on rails set on top of the flume walls. The scope of the investigation was not sufficiently broad to permit the development of all of the relations affecting the performance of the various types of dragheads but did provide sufficient information to permit the development of indications having practical applications in the design and operation of dragheads for hopper dredges. The results indicated that in general the performance of dragheads is affected by the shape and dimensions of the draghead, position of the draghead with respect to the bed, vacuum, and dredging speed.
W71-09570

SANITARY SEWAGE TRANSPORT VELOCITY,
American Society of Civil Engineers, Cambridge, Mass.
M. B. McPherson, L. S. Tucker, and M. F. Hobbs.
In: Advances in Solid-Liquid Flow in Pipes and Its Application; Pergamon Press-Oxford and New York, 1971, p 221-226, 4 fig, 1 tab, 9 ref. Federal Water Pollution Control Administration Demonstration Grant WPD 104-01-66.

Descriptors: *Hydraulics, *Flow rates, *Sewers, *Settling velocity, *Pipe flow, Pipelines, Sewage disposal, Flow separation, Sediment transport, Sanitary engineering, Pressure conduits, Open channel flow, Design flow, Laboratory tests.
Identifiers: *Combined sewers, *Sanitary pressure sewers, Sewer separation.

Tests are summarized of the minimum required flow velocities of sanitary sewage in closed pressure conduits and open channels to preclude deposition of solids. Hydraulic experiments were conducted at the Central Engineering Laboratories of the FMC Corporation in Santa Clara, California using clear plastic pipe of different diameters, from 2 inch through 8 inch. Sewage analyses included determination of pH, COD, grease, total solids, total volatile solids, suspended solids, settleable solids, and specific gravity and amount of settleable solids on each of eleven sieve fractions, the last in terms of both suspended and volatile content. Because no meaningful correlation could be obtained between minimum transport velocities and sewage characteristics analyzed in the initial series of tests, sewage sand content was also determined in the final tests, including specific gravity and amount of each sand sieve fraction. Minimum sand transport velocity findings of Craven for closed conduits, and of Ambrose for closed conduits and open channel flow, are presented as correlated by Laursen. All appropriate full conduit flow data from Ambrose and Craven and the sewage tests are summarized. Velocities causing deposition of suspended solids, and also scouring, were studied. Both comminuted and uncomminuted sewage was employed. This work was conducted in conjunction with the Combined Sewer Separation Project of the American Society of Civil Engineers. It is a study of pressurized sanitary sewerage systems wherein sewage would be pumped from buildings into pressure conduits in existing combined sewers. (Poertner)
W71-09588

INTRODUCTION TO OIL FIELD WATER TECHNOLOGY,
For primary bibliographic entry see Field 05E.
W71-09721

EFFECT OF PHYSICAL PROPERTIES OF POROUS MEDIA ON WATER MOVEMENT,
Idaho Univ., Moscow. Dept. of Agriculture and Bio-Resources Engineering.
For primary bibliographic entry see Field 02F.
W71-09737

TWO LAYER STRATIFIED FLOW IN CONVERGING SECTION,
Water Economics Research Inst., Warsaw (Poland).
For primary bibliographic entry see Field 05B.
W71-09777

MOVEMENT OF SMALL GAS BUBBLES IN SMOOTHLY DECELERATING LIQUID,
Grumman Aerospace Corp., Bethpage, N.Y.
Subba Rao Gutti.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY7, Paper 8251, p 1117-1128, July 1971. 12 p, 7 fig, 15 ref, append.

Descriptors: *Flow, *Hydraulics, *Hydrodynamics, *Bubbles, Viscosity, Shear, Channel flow, Nonuniform flow, Unsteady flow, Flow characteristics, Fluid mechanics, Kinetics.
Identifiers: *Accelerating flow, *Multiphase flow.

The time-dependent motion of small gas bubbles in a decelerating liquid was studied. Expressions for the distance traveled by the bubble and for the bubble slip were derived as functions of liquid gas bubble densities, initial velocities, and in terms of a parameter denoting the ratio of the pressure and viscous interaction forces. In cases where the initial velocity of the bubble is lower than the liquid velocity less the limiting slip, the bubble accelerates relative to the liquid. In cases where the bubble initial velocity is equal to or greater than that of the liquid, the bubble decelerates much faster than the liquid until a limiting slip between the gas bubble and liquid is reached. At the equilbrium conditions, in all cases the gas bubble velocity is found to be smaller than that of the corresponding liquid velocity. (Knapp-USGS)
W71-09811

FLOW AROUND INCLINED SHEET PILE,
Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.
A. Siva Reddy, Govinda C. Mishra, and Kyatsandra Seetharamiah.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY7, Paper 8248, p 1101-1115, July 1971. 15 p, 7 fig, 5 ref, append.

Descriptors: *Flow around objects, *Groundwater movement, *Sheet piling, *Seepage, *Steady flow, Numerical analysis, Mathematical models, Flow nets, Permeability, Porous media, Antisotropy.
Identifiers: Inclined sheet piling.

For analysis of flow around a vertical sheet pile in homogeneous anisotropic soil, it is necessary to investigate the flow characteristics associated with an inclined sheet pile embedded in homogeneous isotropic porous media. As such, the quanitities of seepage, pressure distribution and exit gradient from an inclined sheet pile embedded in a homogeneous isotropic porous medium of finite depth are determined using the Schwarz-Christoffel transformation. Numerical results are presented for different angles of inclination of sheet piles with and without impervious blankets. (Knapp-USGS)
W71-09812

HYDRAULICS AND HYDRAULIC ENGINEERING (Russian: Gidravlika i Gidrotekhnika).

No 10, Kiev, 1970. 112 p.

Descriptors: *Turbulent flow, *Hydraulic properties, *Hydraulic structures, *Fluid mechanics, Hydraulic gates, Hydraulic conduits, Erosion, Reservoirs, Dams, Cavitation, Open channels, Discharge measurement, Drainage, Design data, Hydraulics, Hydrographs, Unsteady flow.
Identifiers: Quaternary clays, Pressure distribution.

This collection of 18 papers includes articles concerned with study of turbulence, cavitation, unsteady and turbulent flow in open channels, movement of fluid with variable discharge and measurement of discharges in pipe lines. A study is made of the problems of erosion in channels composed of cohesive soils and of the reforming of reservoir banks. Methods for draining Quaternary clays, output of recharge basins, operation of water-purification filters and computations of the stability of faces of earth dams are examined. (Josefson-USGS)
W71-09844

JET BIT HYDRAULICS,
Texas Univ., Austin. Petroleum Extension Service.
For primary bibliographic entry see Field 08A.
W71-09923

8C. Hydraulic Machinery

TWO-STAGE METHOD OF PUMPING BY NEGATIVE PRESSURE,
California Univ., Davis. Dept. of Water Science and Engineering.
Robert J. Miller.
Water Resources Research, Vol 7, No 3, p 726-727, Jun 1971. 2 p, 2 fig.

Descriptors: *Pumping, *Equipment, *Pumps, *Hydrostatic pressure, Hydraulic equipment, Siphons, Air entrainment.
Identifiers: *Vacuum pumps.

A two-stage method of pumping liquids by use of air inclusion was developed to allow liquids to be raised to heights much greater than previously attained with vacuum. The principle of the method is simple and is controlled mainly by careful adjustment of air introduction and vacuum. The apparatus is inexpensive and easy to construct. (Knapp-USGS)
W71-09612

8E. Rock Mechanics and Geology

SOME PRINCIPLES AND DEVELOPMENTS IN HARD ROCK DRILLING TECHNIQUES,
For primary bibliographic entry see Field 08A.
W71-09912

ROCK DRILLABILITY RELATED TO A ROLLER CONE BIT,
Dresser Industries, Inc., Hibbing, Minn.
R. I. Morris.
Society of Petroleum Engineers of A.I.M.E. paper number SPE-2389, 1969. 7 p., 4 ref., 1 tab., 7 fig.

Descriptors: *Drilling, *Drilling equipment, Rock mechanics.
Identifiers: *Rock drillability, Roller cone bit, Mining industry, Bit penetration, Drillability index.

The basic bit penetration mechanism of a roller-cone rotary bit in the development of a drillability index for 'hard' rock mining bits is explored. A 1/8 inch radius, hemispherical drill bit element is pressed into a flat surface of a hand sample with a hydraulic pump and ram until a distinct crater is formed. The crater depth divided by the ram load constitutes a penetration or drillability index, p'/E. From this index, bit type, drilling weight, average penetration rate and approximate bit life may be determined. Field results have been well within the degree of accuracy consistent with sampling error. (Campbell-NWWA)
W71-09918

8F. Concrete

OIL-WELL CEMENTING PRACTICES IN THE UNITED STATES.
For primary bibliographic entry see Field 08A.
W71-09710

ROTARY DRILLING: CASING AND CEMENTING.

Issued by Petroleum Extension Service, University of Texas, Austin. Lessons in Rotary Drilling, Unit II, Lesson 4: Casing and Cementing, 1968, 81 p., 58 fig.

Descriptors: Drilling, *Rotary drilling, *Casing, *Cements, Drilling equipment, Oil industry, Drilling fluids.
Identifiers: A.P.I standards, Running casing, Conductor pipe, Surface casing, Casing minimum performance properties.

Drilling for oil or gas involves two main objectives: (1) to bore a hole to the mineral accumulation, and (2) to install a pipe from the reservoir to the surface. The pipe is called 'casing,' and it is usually cemented to insure a pressure - tight connection to the reservoir. Casing in a well has six important functions: (1) to prevent caving of the hole, (2) to prevent contamination of fresh water in upper sands by fluids from lower zones, (3) to exclude water from the producing formation, (4) to confine production to the well bore, (5) to provide a means of controlling well pressure, (6) to permit installation of artificial lift equipment for producing the well. With the cable-tool method numerous strings of casing were set as a well was drilled. But one principal advantage of the rotary method is the fact that much more open hole can be drilled than was ever possible with cable tools. In rotary drilling today open hole can ordinarily be drilled as far as desired because of the better quality muds available. Casing is generally set to serve a specific purpose and is neither arbitrary nor compulsory on account of any certain hole conditions. The cost of casing is often the greatest single item of expense on a well, and the casing used in a typical well may represent a very large investment. Selection of casing sizes, weights, grades, and types of threaded connections for a given situation constitutes an engineering and economic problem of considerable importance. Assuring good material, running in the well, and cementing in place should be planned procedures. (Campbell-NWWA)
W71-09929

8G. Materials

A.P.I. SPECIFICATION FOR CASING, TUBING, AND DRILL PIPE.
American Petroleum Inst., Dallas, Tex. Div. of Production.

A.P.I. Standard 5A, 31st Ed, April 1971, 70 p.

Descriptors: *Casing, *Well casing, *Drilling, Construction materials, Water conveyance, Wells, Oil industry, Pipe.
Identifiers: Pipe manufacture process, Chemical properties, Physical properties, Hydrostatic tests, Dimensions, Pipe ends, Coupling, Thread protectors, Inspection.

The purpose of this specification is to provide standards for casings, liners, tubing, work tubing and drill pipe suitable for use in drilling and producing operations. This specification covers casing, tubing, work tubing, drill pipe and casing liners in the sizes and wall thicknesses applicable to the various grades of pipe as shown in the standard lists and in the dimensional tables. It also includes casing and tubing couplings and thread protectors. Dimensional requirements on threads and thread gages, stipulations on gaging practice, gage specificatio and certification, as well as instruments a methods for inspection of threads are given in A Std 5B and are applicable to products covered this specification. (Campbell-NWWA)
W71-09711

A.P.I. SPECIFICATION FOR GRADE C-75 AN C-95 CASING AND TUBING.
American Petroleum Inst., Dallas, Tex. Div. Production.

API Standard 5 AC, 7th Ed, April 1970, 52 p.

Descriptors: *Casing, *Well casing, *Drillin Water conveyance, Construction materials, Wel Oil industry, Pipe.
Identifiers: Pipe manufacture process, Chemic properties, Physical properties, Hydrostatic tes Dimensions, Pipe ends, Coupling inspection.

The purpose of this specification is to provide sta dards for casing and tubing with restricted yie strength ranges for use in drilling and producti operations. This specification covers Grade C- casing and tubing and C-95 casing in the sizes a wall thicknesses shown in the standard lists (Tabl 1.1 and 1.2), and the dimensional tables (Tabl 6.1 through 6.6). It also includes requirements f couplings and thread protectors. Dimension requirements on threads and thread gages, stipul tions on gaging practice, gage specifications a certification, as well as instruments and metho for inspection of threads are given in API Std 5 and are applicable to products covered by th specification. (Campbell-NWWA)
W71-09712

A.P.I. SPECIFICATION FOR HIGH STRENGTH CASING AND TUBING.
American Petroleum Inst., Dallas, Tex. Div. Production.

API Standard 5AX, 8th Ed, April 1970, 45 p.

Descriptors: *Casing, *Well casing, *Drillin Water conveyance construction materials, Wel Oil industry, Pipe.
Identifiers: *Pipe manufacture process, Chemic properties, Physical properties, Hydrostatic tes Pipe ends, Couplings, Thread protectors.

The purpose of this specification is to provide sta dards for high-strength casing and tubing suitab for use in drilling and producing operations. Th specification covers high-strength seamless ste casing and tubing. It includes casing and non-ups and external-upset tubing, in the sizes and wa thicknesses shown in the standard list, and th dimensional tables. It also includes requiremen for couplings and thread protectors. Dimension requirements on threads and thread gages, stipul tions on gaging practice, gage specifications an certification, as well as instruments and metho for inspection of threads are given in API Std 5 and are applicable to products covered by th specification. (Campbell-NWWA)
W71-09713

A.P.I. SPECIFICATION FOR OIL-WELL CE MENTS AND CEMENT ADDITIVES.
American Petroleum Inst., Dallas, Tex. Div. Production.

API Specification Standard 10A, 16th Edition April 1971, 19 p.

Descriptors: *Cements, *Cement grouting, Por land cements, Slurries, Oil industry.
Identifiers: *Cement additives, Bentonite, Barite Fly ash, Chemical requirements, Physical require ments, Well depth and cementing time, Sampling Tests, Equipment, Classes, Types, Manufacturer' trade names.

This specification covers eight classes of oil-well cement, along with bentonite, barite, and fly ash (tentative) as admixtures in oil-well cement. Two classes of cement are available in the ordinary type (0), seven in the moderate sulfate-resistant type (MSR), and six in the high sulfate-resistant type (HSR), while one has the added property of high early strength. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09714

A.P.I. SPECIFICATION FOR OIL-WELL DRILLING-FLUID MATERIALS.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 13A, 5th Ed, February 1969, 12 p.

Descriptors: *Drilling fluids, *Clays, *Drilling, Rotary drilling, Drilling equipment, Emulsions, Mud, Slurries, Foaming, Oil industry.
Identifiers: *Barite, *Bentonite, *Attapulgite clay, Sampling, Inspection, API authorized suppliers.

This specification is under the jurisdiction of the API Committee on Standardization of Drilling Fluid Materials. The purpose of this specification is to provide standards for materials used in oil-well drilling fluids. This specification covers physical properties and test procedures for materials used in oil-well drilling fluids. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09715

A.P.I. BULLETIN ON PERFORMANCE PROPERTIES OF CASING, TUBING AND DRILL PIPE.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Bulletin 5C2, 17th Ed, April 1970, 65 p, 4 tab.

Descriptors: *Casing, *Well casing, *Hydraulic structures, Water conveyance, Construction materials, *Drilling, Wells, Oil industry, Pipe.
Identifiers: *Collapsed pressure, *Internal yield pressure, Pipe body yield strength, Joint strength, Compression strength.

This bulletin is not intended as a design manual. Its purpose is to provide minimum performance properties on which the design of casing, tubing, and drill pipe strings may be based. The performance properties as given herein cover the grades, sizes, and weights of casing, tubing and drill pipe as given in API Stds 5A, 5AC, and 5AX. Values for various performance properties of casing, tubing, and drill pipe conforming to API Std 5A, 5AC, and 5AX are given in Tables 1 through 4. The values shown are minimum values and do not include factors of safety. In the design of casing, tubing, or drill pipe strings, factors of safety should be used as are considered necessary for the particular application. (Campbell-NWWA)
W71-09716

A.P.I. BULLETIN ON NONDESTRUCTIVE TESTING TERMINOLOGY.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Bulletin 5T1, 2nd Ed, April 1971, 14 p.

Descriptors: *Fabrication, *Welding, Welded joints, Construction, Oil industry.
Identifiers: *Testing terminology, Imperfections in steel pipe, Double submerged arc welds, Electric flash-welds, Electric resistance welds.

This bulletin is under the jurisdiction of the API Committee on Standardization of Tubular Goods. The purpose of this bulletin is to provide definitions of imperfections and defects which occur in steel pipe. The word 'imperfection' as used herein refers to metallurgical and other features of steel pipe products which may or may not be injurious to the use of the product. Definition of injuriousness is outside the scope of this document. Injurious defects are defined in the respective pipe standards. It should be noted that the definitions are listed in English, French, German, Italian, Japanese, and Spanish. (Campbell-NWWA)
W71-09717

API SPECIFICATION FOR LINE PIPE.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 5L, 26th Ed, April 1971, 59 p.

Descriptors: *Pipes, *Well casing, *Construction materials, Hydraulic structures, *Water conveyance, Drilling, Pipelines, Metal pipes, Wells, Oil industry.
Identifiers: *Process of pipe manufacture, Chemical properties and tests, Physical properties and tests, Hydrostatic tests.

The purpose of this specification is to provide standards for pipe suitable for use in conveying gas, water, and oil in both the oil and natural gas industries. This specification covers seamless and welded steel line pipe. It includes standard-weight and extra strong threaded pipe; and standard weight plain-end, regular-weight plain-end, special plain-end, extra-strong plain-end, and double-extra-strong plain end pipe. The sizes and wall thicknessess applicable to the various processes of manufacture under this specification are indicated in the dimensional tables herein. Dimensional requirements on threads and thread gages, stipulations on gaging practice, gage specifications and certification, as well as instruments and methods for inspection of threads are given in API Std 5B and are applicable to products covered by this specification. Grade X60 or higher pipe (API Std 5LX) shall not be substituted for pipe ordered to this specification without purchaser approval. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09718

A.P.I. SPECIFICATION FOR HIGH-TEST LINE PIPE.
American Petroleum Inst., Dallas, Tex. Div. of Production.

API Standard 5LX, 18 Ed, April 1971, 60 p.

Descriptors: *Pipes, *Well casings, *Construction materials, Hydraulic structures, Pipelines, Water conveyance, Drilling, Well regulations, Metal pipes, Wells, Oil industry.
Identifiers: *Process of pipe manufacture, Chemical properties and tests, Physical properties and tests, Hydrostatic tests, Dimensions, Nondestructive inspection.

The purpose of this specification is to provide standards for more rigorously tested line pipe having greater tensile and bursting strengths than for pipe manufactured under API Std. 5L. Metric conversions of English units are provided throughout the text of this specification in parentheses. This specification covers high-test line pipe in grades X42, X46, X52, X60, X65, and grades intermediate thereto. The chemical composition and certain physical properties of intermediate grades are subject to agreement between the purchaser and manufacturer. The agreed upon requirements must be consistent with the corresponding requirements for grades X42, X46, X52, X56, X60 and X65. Grade X60 or higher pipe shall not be substituted for pipe ordered for grade X52 and lower without purchaser approval. American Petroleum Institute (API) specifications are published as an aid to procurement of standardized equipment and materials. These specifications are not intended to inhibit purchasers and producers from purchasing or producing products made to specifications other than API. (Campbell-NWWA)
W71-09719

THE EFFECTS OF DRILLING-MUD ADDITIVES ON OIL-WELL CEMENTS.
American Petroleum Institute, Dallas, Tex. Div. of Production.

API Bulletin D-4, March 1963, 39 p, 28 tab, 1 fig, 21 ref. (A report prepared by the API Mid-Continent District Study Committee on Cementing Practices and Testing of Oil-Well Cements.

Descriptors: *Cements, *Cement grouting, Portland cement, Slurries, Oil industry.
Identifiers: *Cement additives, Cement strength, Thickening time, Retarders, Accelerators, Sodium hydroxide, Sodium carbonate, Sodium silicate, Dosium hexametaphosphate, Sodium acid pyrophosphate, Sodium chloride, Starch, Sodium carboxymethylcellulose, Salts of liqninsulfonic acid-kembreak, Tanninquebracho, Sodium palconate, Tall-oil soap, Carbonox.

The information contained in this report summarizes the data obtained from a series of cooperative tests conducted by the API Mid-Continent District Study Committee on Cementing Practices and Testing of Oil-well Cements to determine the effect of a number of drilling-mud treating chemicals on the thickening time and strength of three types (API Class A, D, and E) of commercial cements commonly used in oil-well cementing operations. This study revealed that many of the additives, notably the organic materials in relatively small quantities, had a marked effect on the properties of the cements tested. The results of this study emphasize the fact that precautionary measures should be taken to prevent contamination of the cement with drilling mud when cementing oil wells. (Campbell-NWWA)
W71-09720

A BASIC STUDY OF FERROUS MATERIALS FOR DESALINATION EQUIPMENT,
Case Western Reserve Univ., Cleveland, Ohio.
A. R. Troiano, and R. F. Heheman.
For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402, Price $0.65. Office of Saline Water Research and Development Progress Report No 637, December 1970, 59 p, 19 fig, 3 tab, 43 ref, append. OSW Contract 14-01-0001-1443.

Descriptors: *Desalination, *Iron alloys, *Corrosion, *Pitting, Corrosion control.
Identifiers: Instantaneous corrosion rate, Tafel slope, Weight loss tests, *Electrochemical methods, Linear polarization, Surface enrichment.

Of primary interest was an examination and an evaluation, both theoretical and practical, of accelerated corrosion rate measurements by electrochemical methods to provide information much quicker than conventional weight loss tests. These instantaneous corrosion rate determinations also provide a means for continuous monitoring and control of the corrosive environment. There are, essentially two such methods, Tafel, and that of Linear Polarization. Material used throughout most of this work was 'Glidden' iron with impurity contents of C .005, P .003, S .004, Si .005, Cr .001, Co .001, Mn .002, Ni .001 and an alloy of iron - 9% Chromium. Studies were made of the effects of temperature, pH, time, and the influence of

Chromium alloying and dissolved oxygen. Weight loss studies comprised the second part of this research. Alloys consisted of commercially available ferrous alloys containing major alloying elements of Si, Cr, and Mo and the counterparts of these alloys prepared from high purity elements. Methods and procedures of preparation and testing are presented along with results. A third part of this program explored the concept of surface enrichment of a base metal (iron) with a noble metal. Iron-platinum, iron-iridium, iron-gold alloys were examined. (Filban-Office of Saline Water)
W71-09746

MASTER THE TOOLS THAT COMBAT CORROSION,
Corrosion Mitigation Inc., Marietta, Ga.
H. C. Van Nouhuys.
Pipeline Engineer, Vol. 34, No. 3, p 286, 288, 292 and 294, March 1962.

Descriptors: *Corrosion, *Well casing, *Water well, Groundwater, Water quality.
Identifiers: Galvanic anodes, Rectifiers, Ground bed systems, Pipe coatings.

The corrosion engineer has five basic tools with which to combat corrosion: galvanic anodes, rectifier-ground bed units, coatings, bonds, and insulators. How and where the corrosion engineer uses each method, or combination of methods, can spell the difference between an effective or an ineffective job of corrosion mitigation. Some examples are (1) a bare pipeline in high resistivity soil requires rectifiers instead of galvanic anodes; (2) galvanic anodes, strategically placed in a pump station piping network, give protection that rectifier currents cannot provide; (3) where a coated, protected foreigh line crosses under a bare, protected line, a bond is not the answer, but coating the bare line several hundred feet in each direction restores normal potentials to the coated line without bond; (4) a good bond is highly essential, however, at the terminal dock; and (5) the combined use of rectifiers and anodes is not recommended. This papers also has applicability to water well installations. (Campbell-NWWA)
W71-09915

8H. Rapid Excavation

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For primary bibliographic entry see Field 08A.
W71-09914

10. SCIENTIFIC AND TECHNICAL INFORMATION

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Cornell Univ., Ithaca, N. Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06A.
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Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre D'Etudes Nucleaires.
For primary bibliographic entry see Field 05C.
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For primary bibliographic entry see Field 05G.
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For primary bibliographic entry see Field 06E.
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05B	W71-09777	05B	W71-09820	05B	W71-09863	4B	W71-09911
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05A	W71-09799	02J	W71-09842	06B	W71-09886		

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Source	Accession Numbers	Total
A. Center of Competence		
National Water Well Association - Water Well Construction Technology	W71-09710 -- 09734 09904 -- 09931	53
AEC Oak Ridge National Laboratory - Nuclear Radiation and Safety	W71-09489 -- 09494 09496 -- 09519 09522 -- 09523 09847 -- 09864	50
U.S. Geological Survey - Hydrology	W71-09593 -- 09657 09802 -- 09827 09829 -- 09846 09467	110
Rutgers-the State University - Water Resources Economics	W71-09477 -- 09488 09684 -- 09687 09690 -- 09691 09693 -- 09697 09865 -- 09868 09870 -- 09881 09883 -- 09884 09886 -- 09887 09889 -- 09890 09892 -- 09895 09897 -- 09900 09902 -- 09903	55
University of Texas - Wastewater Treatment and Management	W71-09524 -- 09551 09553	29
University of Washington - Water Quality Requirements for Aquatic Organisms	W71-09658 -- 09659 09661 -- 09662 09664 -- 09683	24
Vanderbilt University - Thermal Pollution	W71-09765, 09767 -- 09784 09787	20
Iowa State University - Agricultural Livestock Wastes	W71-09747 -- 09764	18
Oceanic Research Institute - Coastal Pollution	W71-09788 -- 09801	13
University of Chicago - Metropolitan Water Resources Management	W71-09469 -- 09476	8
University of Florida - Eastern US Water Law	W71-09698 -- 09709 09495, 09552 09564, 09589 09660, 09663 09688, 09689 09692, 09744 09766, 09785 09786, 09828 09869, 09882 09898, 09520	29

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B. State Water Resources Research Institutes		
New York Water Resources and Marine Sciences Center	W71-09465 09738 -- 09741	5
Georgia Environmental Resources Center	W71-09466, 09554	2
Ohio Water Resources Center	W71-09555	1
Kansas Water Resources Research Institute	W71-09556	1
Minnesota Water Resources Research Center	W71-09557	1
Mississippi Water Resources Research Institute	W71-09558	1
Arkansas Water Resources Research Center	W71-09559	1
Wisconsin Water Resources Center	W71-09560 -- 09562	3
New Hampshire Water Resources Research Center	W71-09563	1
Iowa Water Resources Research Institute	W71-09736	1
Idaho Water Resources Research Institute	W71-09737	1
Texas Center for Research in Water Resources	W71-09742 -- 09743	2
Wyoming Water Resources Research Institute	W71-09745	1
C. Others		
Engineering Aspects of Urban Water Resources (Poertner)	W71-09577 -- 09588 09590 -- 09592	15
Office of Water Resources Research	W71-09468, 09735	2
Office of Saline Water	W71-09746	1

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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
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